



SPECIFICATIONS
DIVISIONS 1 TO 16
T.G.I. FRIDAY'S RESTAURANT

BRIDGEPORT, WEST VIRGINIA

P1 1.1 PROTO

JULY 22, 2015

PROJECT MANUAL
FOR
T.G.I. Friday's Restaurant
Proto P11.1

OWNER: **Bridgeport Restaurants, LLC**

ARCHITECT: **Damon Drennan, Architect**
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DATE: **22 July 2015**

DOCUMENT 00010

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GEOTECHNICAL DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.

1.2 INVESTIGATION

- A. An investigation of subsurface soil conditions at the building site was authorized by Owner, and these investigations were made by NGE, LLC, NGE PROJECT no. W15096, dated June, 2015.

1.3 REPORT

- A. The full Report is bound herein for information only.
- B. Report and log of borings are available for Contractor's information but is not a warranty of subsurface conditions, nor is it a part of the Contract Documents.

1.4 RESPONSIBILITY

- A. Bidders are expected to examine the site and subsurface investigation reports, and then decide for themselves the character of the materials to be encountered.
- B. The Architect and Owner assume no responsibility for variations of subsoil quality or conditions.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF DOCUMENT



**GEOTECHNICAL INVESTIGATION
TGI FRIDAYS BUILDING
BRIDGEPORT, WEST VIRGINIA**

NGE PROJECT No. W15096

SUBMITTED TO:

**THRASHER
BRIDGEPORT, WEST VIRGINIA**

SUBMITTED BY:

**NGE, LLC
ST. ALBANS, WEST VIRGINIA**

JUNE 2015



June 19, 2015

Mr. Chad M. Riley, P.E.
Thrasher
600 White Oaks Boulevard
Bridgeport, West Virginia 26330

Subject: Geotechnical Investigation
TGI Fridays Building
Bridgeport, West Virginia
NGE Project No. W15096

Dear Mr. Riley:

In accordance with your request, we have performed a geotechnical investigation at the site of the proposed TGI Fridays in Bridgeport, West Virginia. Our services were performed in accordance with the scope of work outlined in our Proposal No. PW15623, dated June 1, 2015.

This report presents the results of the field and laboratory investigation performed to determine the subsurface conditions, as well as our conclusions and recommendations pertaining to site earthwork in the building and parking lot area and design of the building foundations.

We appreciate the opportunity to assist you with this project. Please contact us if you have any questions concerning this report, or if we can provide any further assistance with this project.

Respectfully submitted,
NGE, LLC

A handwritten signature in black ink, appearing to read 'Noah Stevens'.

Noah Stevens, E.I.
Staff Engineer

A handwritten signature in black ink, appearing to read 'John E. Nottingham'.

John E. Nottingham, P.E.
Principal Engineer

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FIGURES

Figure No. 1 – Boring Location Plan
Figures 2 through 10 – Test Boring Logs for B-1 through B-5 and P-1 through P-4

APPENDICES

APPENDIX A - Results of Laboratory Testing

1.0 SCOPE OF SERVICES

The purpose of our investigation was to evaluate subsurface conditions and develop site earthwork recommendations in the building and parking lot area as well as foundation design recommendations. The results of our field exploration and geotechnical engineering evaluation are presented in the following report. Our actual scope of services consisted of the following items:

- Field coordination including site reconnaissance, drilling supervision, and sample logging.
- Drilling of 4 test borings with standard penetration testing and sampling.
- Review of previous borings drilled at the site by Terracon.
- Laboratory testing of selected soil specimens.
- Preparation of a geotechnical engineering report to address the following items:
 - A description of the subsurface conditions encountered at the test boring locations;
 - Results of our laboratory testing;
 - Recommendations for site preparation in the building and parking lot area;
 - Recommendations concerning foundation type, depth, allowable bearing pressure, and estimated foundation settlement;
 - Recommendations for concrete slab-on-grade design and construction including subgrade preparation;
 - Recommendations for pavement subgrade preparation.

The scope of services represented by this report does not include an environmental assessment, or exploration for the presence or absence of wetlands, hazardous, or toxic material at the site. Moreover, the scope of services does not include evaluation of the potential for subsidence from past underground mining or slope stability analysis of the existing fill slope located southeast of the proposed building.

2.0 SITE & PROJECT DESCRIPTION

The proposed TGI Friday's site is located in Bridgeport, West Virginia just south of South View Drive and northwest of I-79. The proposed site location is grass covered and relatively level with some moderate slopes to the south of the site. Based on information provided by Thrasher, the proposed building site was formerly graded to its present elevation by placement of engineered fill within a natural valley area. Little additional grading will be required to develop the site. The proposed structure and parking areas are illustrated on Figure No. 1.

3.0 TEST BORINGS

3.1 Boring Locations & Depths

Four borings (Borings N-1 through N-4) were drilled for the proposed structure. The approximate boring locations are shown on Figure No. 1. The boring locations were chosen by our engineer and staked in the field by a Thrasher survey crew. Borings N-1 through N-3 were extended to a depth of 21.5 feet below the existing ground surface and Boring B-4 was extended to a depth of 50.5 feet below the ground surface. In addition, NGE reviewed the boring logs performed by Terracon in the vicinity of the proposed development (Boring Nos. B-1 to B-5, B-12 and B-13 as shown on Figure No. 1). Auger cuttings were also acquired for sulfur fractionation analysis from the locations of Terracon's Borings B-3, B-5, and B-13.

3.2 Subsurface Exploration Methods

Within each test boring drilled by NGE, split-tube sampling and Standard Penetration Tests (SPT) were performed in general accordance with ASTM D 1586. The soil test borings were advanced using hollow-stem augers. Soil samples were obtained with a standard 2-inch O.D., 1.4-inch I.D., split-tube sampler. Samples were obtained at 2½ foot centers from the ground surface to 15 feet below the ground surface. Below 15 feet, sampling was performed at 5 foot intervals. SPT sampling and testing is accomplished by driving the split-spoon sampler in 6-inch increments for a total length of 18 inches with blows of a 140 pound hammer free falling for a distance of 30 inches. The number of blows required to drive the sampler the final foot of penetration (i.e., the last two 6-inch increments) is the standard penetration resistance (a.k.a., the N-value). The N-value is an index to soil strength, density, and foundation bearing capacity. A representative portion of each sample obtained from the split tube sampler was sealed in airtight glass jars. Upon completion of drilling, all of the soil and rock samples were transported to our laboratory for detailed examination and testing. The boring logs located in the back of this report provide detailed soil descriptions and the standard penetration blow counts.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered by the test borings are shown on the boring logs (Figures 2 through 6). The boring logs represent our interpretation of the subsurface conditions based on examination of the split-spoon samples. Conditions represented by the test borings should be considered applicable only at the boring locations. It should be assumed that the reported conditions might be different at other locations. The general subsurface conditions encountered and their pertinent characteristics are described in the following paragraphs.

4.1 Soil Conditions

Approximately 2 to 3 inches of topsoil was encountered in the borings. Soils encountered below the topsoil at the site consisted of fill material. The fill material was comprised of silty to sandy clay with varying amounts of rock fragments. N-values within the fill were variable, ranging from 7 to over 50 blows per foot (bpf). The higher blow counts were observed in zones of containing high amounts of rock fragments. Although there were some higher N-values, most of the N-values were relatively consistent indicating that the material was likely placed in an engineered fashion. All of the borings were terminated within the fill material, with the exception of Boring N-4. Natural silty clay was encountered beneath the fill in Boring N-4 at a depth of 40 feet. The natural clay extended to bedrock at a depth of 50.0 feet. The N-values within the natural clay were observed to range from 19 to 44 bpf, indicative of a very stiff to hard cohesive soil condition.

4.2 Groundwater

Water was encountered during drilling and sampling in N-3 at a depth of 20.5 feet; however, Boring N-3 was noted as being dry upon completion of drilling. The presence or absence of water in the boreholes at the time of drilling does not necessarily mean that groundwater will or will not be present at other times or locations. Seasonal variations in rainfall will cause fluctuations in groundwater levels and influence the presence of water in upper soils.

4.3 Results of Laboratory Testing

Laboratory testing of recovered soil specimens included natural moisture content, Atterberg liquid and plastic limits, and sulfur fractionation test. The results of the Atterberg limit testing and sulfur fractionation are summarized in **Table 4.1** and **Table 4.2** below. Results of our laboratory tests are also provided in Appendix A.

Table 4.1 – Summary of Laboratory Classification Testing

Boring & Depth	Atterberg Limits		Soil Description
	LL	PI	
N-1 / S-3 5.0 – 6.5 ft.	38	15	Gray SILTY CLAY (CL) with rock fragments
N-2 / S-3 5.0 – 6.5 ft.	35	14	Gray SILTY CLAY (CL) with rock fragments

Table 4.2 – Sulfur Forms

Boring & Depth (ft bgs)	Total Sulfur %	Pyritic Sulfur %	Sulfate Sulfur %	Organic Sulfur %
B-3 (0.5 – 2.0)*	0.39	0.14	0.13	0.13
B-5 (0.5 – 2.0)*	0.74	0.34	0.22	0.17
B-13 (0.5 – 2.0)*	0.34	0.12	0.09	0.14
N-1 (0.5 – 2.0)	1.18	0.30	0.47	0.41
N-2 (0.5 – 2.0)	0.33	0.15	0.03	0.15
N-3 (0.5 – 2.0)	0.42	0.15	0.09	0.19
N-4 (0.5 – 2.0)	0.06	Negligible	Negligible	Negligible

*Note: Boring location previously drilled by Terracon consultants. Bag sample acquired for sulfur fractionation from auger cuttings at these locations by NGE June 2015.

5.0 SITE PREPARATION & GRADING RECOMMENDATIONS

5.1 Site Preparation

All existing vegetation and topsoil located within the development area should be removed prior to beginning site grading and/or other construction activities. Any underground utility lines located in the building area should be removed. All voids created by removal of underground items should be properly backfilled in accordance with Section 5.2 of this report.

The development of the site should address surface drainage. Appropriate drainage should be provided both during and after site grading is complete such that surface water does not become ponded or entrapped around the building or paved areas.

After stripping of the topsoil, the exposed subgrade should be proof-rolled and compacted using a minimum 10 ton static weight smooth drum vibratory roller. The proof-rolling will cause rutting and deformations of softer soils, and densify firmer soils. Over-excavation and recompaction of soft soil should be performed. NGE personnel should observe and document the performance of the proof-rolling.

5.2 Fill and Backfill Recommendations

According to the site plan provided by the client, minimal fill will be required to develop the site. Prior to placement of fill, all vegetation and topsoil must be removed. Any soft areas during the site development should be undercut and backfilled at the direction of a qualified geotechnical engineering firm. Fill and backfill should be placed in maximum 9-inch loose lifts and compacted to 98% of the maximum dry density as determined by the standard Proctor laboratory test (ASTM D-698). Each layer of fill or backfill should be tested by a qualified geotechnical firm to determine that adequate compaction has been achieved prior to placement of additional fill lifts. Fill or backfill should consist of non-organic soil/rock material with a maximum particle size of 4 inches in any direction and a plasticity index not greater than 18 percent. The moisture content of fill or backfill material should be within three percent of the optimum moisture content as determined by a standard Proctor test. We recommend fill material placed within 18 inches of the building floor subgrade elevation have a pyritic sulfur content less than 0.1 percent.

Limited Space Backfilling – Limited spaces are defined as areas where backfill operations are restricted to the use of small mechanical compaction equipment. Most deficiencies in compacted backfill around subsurface structures have occurred in limited spaces where required densities are difficult to achieve because of restricted working room and relatively low compaction effort or use of equipment that is too lightweight. All structural backfill, including that placed in limited spaces must be systematically compacted to the project requirements, even if crushed aggregate is placed. Oversized rock fragments should not be placed around pipes or other below-ground structures.

Proper placement and compaction of backfill around pipes, conduits and utility lines is often difficult and should require special attention. Clearly defined project specifications for confined zone backfill compaction and sufficient field monitoring are essential in preventing problems associated with utility trench backfill settlement. Backfilling in limited access areas, such as utility trenches, and around below grade structures such as manholes, junction boxes, curb inlets, etc. should have a lift thickness limited to 4 to 6 inches loose measure. A sufficient amount of testing or observation should be conducted to verify that proper compaction is achieved. In extremely tight spaces, use of alternate backfill materials such as flowable fill should be considered.

5.3 Excavation Considerations

Any excavation in which workers are required to enter must be properly shored or sloped in accordance with OSHA requirements. Any water which collects within excavations should be promptly removed by pumping from a strategically located sump(s).

6.0 FOUNDATION & FLOOR SLAB RECOMMENDATIONS

6.1 Building Foundations

Based on the results of the test borings, the bearing materials encountered onsite are adequate for support of the structure on conventional spread foundations. We recommend spread foundations be designed using a maximum allowable bearing pressure of 2,000 psf.

Foundation excavations should be inspected by NGE. We recommend all exterior foundations be constructed to bear at least 3.0 feet below finish grade to provide adequate frost protection. Minimum foundation dimensions of 2.0 and 3.0 feet are recommended for continuous wall and individual column foundations, respectively. Although these dimensions may not fully utilize the recommended bearing pressure, they should be maintained to reduce the potential for a local shear or “punching” type failure of the bearing materials. In addition, the following items should be considered in the foundation design and construction:

1. Excavation can result in loosening of the bearing material in the footing trenches. Any loose/soft soil should be removed or properly recompacted. The footing bearing surfaces should be observed by **NGE** personnel to confirm that the exposed soil is in compliance with the design bearing capacity. During field observations, it may be necessary to lower the bearing elevation in order to reach a suitable bearing stratum. The project specifications and design drawings should note that it may be necessary to adjust the footing depth following field observation by the project geotechnical engineer.
2. Where it is necessary to extend a footing below the planned depth in order to reach a suitable bearing level, the overexcavation can be backfilled with lean concrete or compacted dense-graded aggregate, such as Class 1 – Crusher-run Limestone, and the footing can be constructed at the planned bearing elevation.
3. Soil exposed in the base of all satisfactory foundation excavations should be protected against any detrimental change in conditions such as disturbance from construction activities, frost, or standing water. Surface runoff should be drained away from the excavations and not be allowed to pond. If possible, all footing concrete should be poured during the same day the footing excavation is made.
4. Site grading plans should provide for positive drainage away from the building. The contractor should be directed to conduct grading operations in such a manner as to provide positive drainage during the construction period. All roof drains should be directed away from foundations and positive drainage should be established and maintained to minimize the amount of surface water entering the near surface soils.

6.2 Foundation Settlement Considerations

Foundation settlement was estimated using the results of the test borings and a foundation bearing pressure of 2,000 psf. Soil compression parameters were estimated based on the bearing soil type, lab test results and our past experience with similar conditions. Based on this information, we estimate a total maximum long term foundation settlement of approximately 2 inch and maximum differential settlement of about 3/4 inch or less.

The effect of differential settlement which may occur along masonry walls or brick veneer can be reduced by including steel reinforcements in the top and bottom of continuous wall footings, and by the use of vertical control joints constructed at an aspect ratio of 1.5 or less (aspect ratio is wall section length to height ratio). For example, the maximum vertical control joint spacing for a 12 feet high wall = 12 ft. x 1.5 = 18.0 feet. In addition, vertical control joints should be provided at locations of stress concentrations such as: changes in wall height,

changes in wall thickness, near one or both sides of door and window openings, and adjacent to corners of walls or intersections within a distance equal to half the control joint spacing.

6.3 Slabs-on-Grade

Based on results of pyritic sulfur content testing of the existing near surface soils, there is some potential for concrete slab heave due to the expansive nature of the pyritic soil. We recommend the upper 18 inches of floor slab subgrade be undercut and replaced with backfill meeting the requirement of Section 5.2 of this report (backfill material with a pyritic sulfur content of less than 0.1 percent).

The upper four inches of slab subgrade should consist of free draining crushed stone, such as No. 57 stone to serve as a capillary water barrier and a leveling surface. The use of a vapor barrier between the gravel layer and bottom of the floor slab should be at the discretion of the architect who can evaluate the potential impact of water vapor transmission on floor coverings and interior furnishings. In order to control slab cracking, floor slabs should be jointed as per ACI guidelines and any crack control inclusion such as wire mesh should be permanently supported in its proper position and not pulled up with hook bars during concrete placement.

7.0 PAVEMENT SUBGRADE CONSIDERATIONS

Based on the soil test boring information and our current understanding of the project, we anticipate that areas to be paved will be underlain by newly placed and existing engineered fill. Immediately prior to base course placement and pavement construction, the geotechnical engineer should evaluate areas to be paved. This evaluation should include proof-rolling of the exposed subgrade with a 10-ton smooth drum roller. Proof-rolling would serve to densify the upper soils and reveal areas containing soft or loose soil where undercutting or other improvement of the subgrade soils may be required. Soft areas should be undercut to a firm level and backfilled with engineered fill placed and compacted in accordance with Section 5.2 of this report.

7.1 Subgrade Drainage

Pavements fail for many reasons ranging from improper construction, design or materials. However one very important cause of failure lies in the drainage of the subgrade. Published studies indicate poor drainage accounts for approximately 60% of all pavement failures. Water penetration under the pavement can occur from various sources including the following:

- a. Ingress via cracks and joints or from unpaved adjoining areas.
- b. Water pooling at the edges of the pavement and curbs and entering the base.
- c. Excessive runoff or seepage from landscape planters or lawn areas.
- d. Improperly backfilled trenches under the pavement.
- e. Lack of slope on pavement causing pooling on the surface.

We recommend the pavement subgrade be sloped and/or crowned to provide positive drainage. Installation of edge drains, interceptor drains and longitudinal drains should also be considered in the pavement design.

7.2 Subgrade Protection from Construction Traffic and Disturbance

Often after the subgrade has been moisture conditioned and prepared to a stable condition, construction traffic and inclement weather cause disturbance of the subgrade. It is essential that the subgrade be restored prior to placement of pavement base materials.

8.0 CONSTRUCTION TESTING

We recommend that a qualified geotechnical firm be retained by the owner to provide a comprehensive construction-testing program to assist the owner in determining that certain aspects of construction are being carried out in general conformance with the applicable plans and specifications. This construction testing primarily includes testing of fill materials during placement and compaction and observation of foundation construction.

9.0 REPORT LIMITATIONS

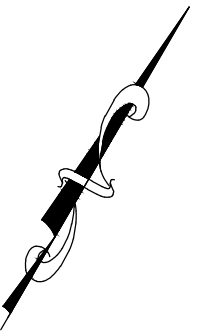
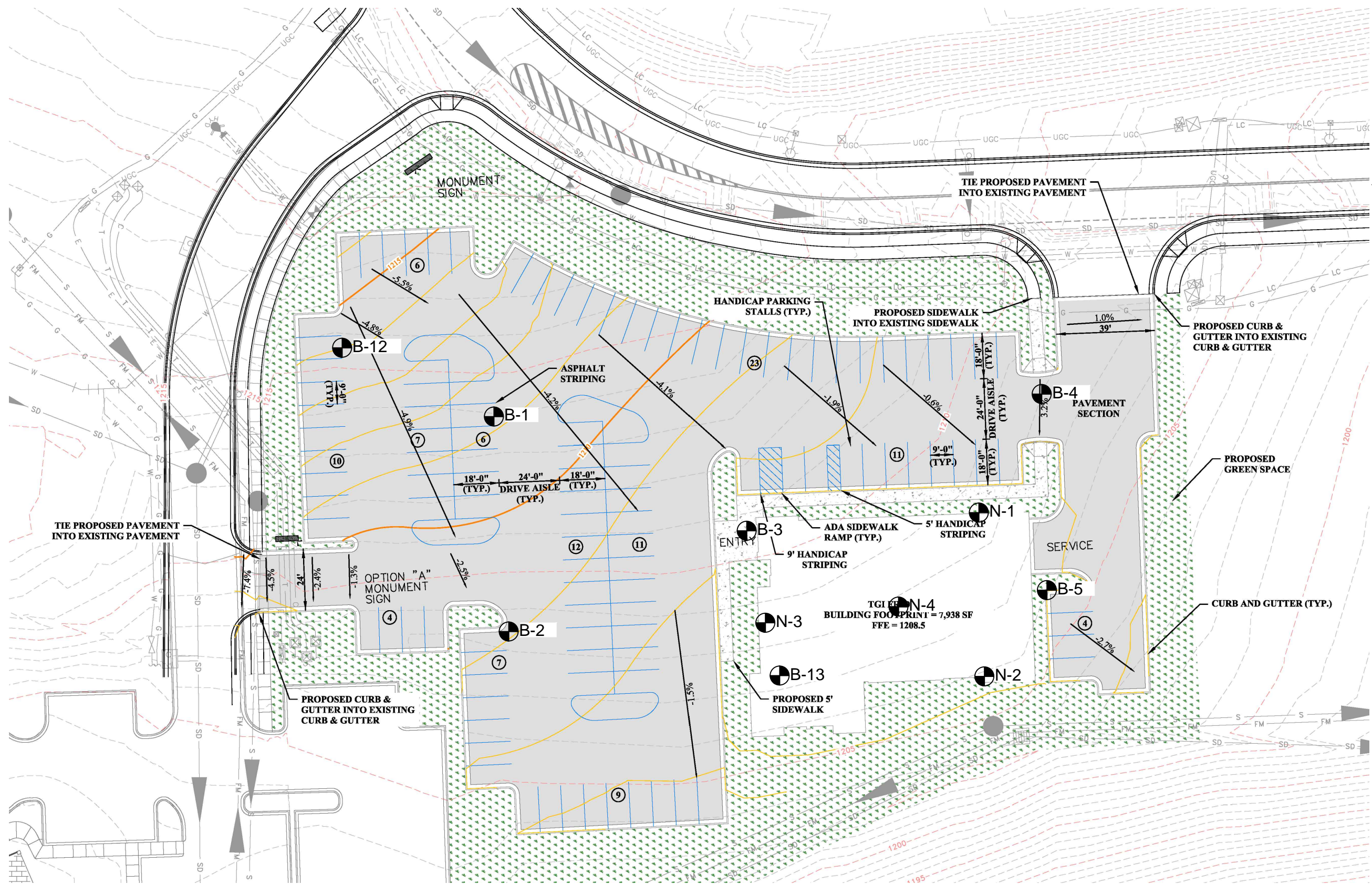
In addition to limitations described in the body of our report, additional limitations apply; some of these are described below:

- This report has been prepared for the exclusive use of Thrasher for application to the subject project. All recommendations contained in this report have been made in accordance with generally accepted soil and foundation engineering practices in the area and at the time where the services were performed. No other warranties are implied or expressed.
- The scope of this investigation did not include an investigation or study to assess the potential for damage due to possible mine subsidence.
- The analysis and recommendations submitted in this report are based, in part, upon the data obtained from a limited number of soil test borings. The nature and extent of variations in soil conditions between the borings may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report and provide additional recommendations.
- Contractors reviewing this report should acknowledge that the discussions and recommendations contained herein are for design information purposes only and may not be sufficient to prepare accurate bids. Any conclusions drawn by the contractor regarding subsurface conditions, quantities of unsuitable soils, rock, groundwater or methods and means of construction are at their sole risk.
- It is important that the geotechnical engineer be provided the opportunity to review the final geotechnical construction related plans and specifications to verify that the recommendations in this report are properly interpreted and incorporated in the design. It will be the client's responsibility to furnish the final grading and foundation plans to NGE for the necessary review. If the geotechnical engineer is not accorded the privilege of making this recommended

review, he can assume no responsibility for misinterpretation of these recommendations.

- On some projects we have noted that civil engineers or other design disciplines have used or represented the geotechnical report as a '*grading/sitework specification*' in lieu of preparing a site specific earthwork specifications with appropriate bid allowances defining the basis of measurement and payment. In no case should this report be utilized as a substitute for a proper and detailed site specific earthwork and foundation specifications.

Figures



REVISION	
NO.	
DATE	

NGE
 Geotechnical & Environmental Engineering Services
 650 MacCorkle Avenue West
 Salt Lake City, Utah 84119
 (304) 201-5180 FAX 201-5182
 www.ngeconsulting.com

PROJECT: TGI FRIDAYS - BRIDGEPORT
 CLIENT: THRASHER ENGINEERING

SHEET: BORING PLAN

Project No.	W15096
Drawn:	NLS
Checked:	NGE
Approved:	NGE
Scale:	1"=40'
Date:	6-11-15
CAD File #	NA

FIGURE NO. 1

NOTES

- BORING LOCATION PLAN IS FOR ILLUSTRATIVE PURPOSES ONLY; BORING LOCATIONS ARE APPROXIMATE.
- SITE PLAN IS BASED ON DRAWING PROVIDED BY THRASHER ENGINEERING.

LEGEND

- N-# APPROXIMATE LOCATION OF BORING DRILLED BY NGE
- B-# APPROXIMATE LOCATION OF BORING PREVIOUSLY DRILLED BY TERRACON CONSULTANTS





Project Name: **TGI Fridays
Bridgeport, West Virginia**

BORING NO.

Project Number: **W15096**

N-3

Elevation	Depth, feet	Sample Type	Symbol / USCS	Location: Offset:		Recovery %	RQD	Penetration Blows / 6 inches	HCSI	Moisture %	Silt and Clay %	Sand %	Liquid Limit	Plasticity Index
				Surface El.: 1208.3 ft.										
				<input type="checkbox"/> Split Spoon <input type="checkbox"/> Shelby Tube <input type="checkbox"/> Rock Core <input type="checkbox"/> Bag Sample										
MATERIAL DESCRIPTION														
TOPSOIL				0.2'										
Brown and gray SILTY TO SANDY CLAY with many shale, siltstone, and sandstone rock fragments, moist to wet, stiff to hard														
1205	5													
1200	10													
1195	15													
1190	20													
-- FILL --				21.5'										
Bottom of Test Boring @ 21.5 ft.														
1185	25													
1180	30													

WV.DOT.LOG - LOGS.GPJ NGELOG.GDT 6/19/15

Completion Depth:	20.5 ft.
Date Boring Started:	6/3/15
Date Boring Completed:	6/3/15
Engineer/Geologist:	NLS
Driller:	NGE

Remarks: **Water was first noted at a depth of 20.5 ft. Boring was noted as being dry upon completion.**

Depth to Water @ 24 hrs.: ---



Project Name: **TGI Fridays
Bridgeport, West Virginia**

BORING NO.

Project Number: **W15096**

N-4

Elevation	Depth, feet	Sample Type	Symbol / USCS	Location: Offset:		Recovery %	RQD	Penetration Blows / 6 inches	HCSI	Moisture %	Silt and Clay %	Sand %	Liquid Limit	Plasticity Index
				Surface El.: 1208.2 ft.										
				<input type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Shelby Tube <input checked="" type="checkbox"/> Rock Core <input type="checkbox"/> Bag Sample										
MATERIAL DESCRIPTION														
				TOPSOIL				4-50/2"						
				Brown and gray SILTY TO SANDY CLAY with many shale, siltstone, and sandstone rock fragments, moist, stiff to very stiff										
1205	5							4-5-4		13				
								3-5-6						
1200	10							19-9-10		17				
								15-16-11						
1195	15							7-10-20		15				
								5-7-12						
1190	20							6-11-12						
1185	25							5-8-11						
1180	30													

-- FILL --

Completion Depth:	50.4 ft.
Date Boring Started:	6/3/15
Date Boring Completed:	6/3/15
Engineer/Geologist:	NLS
Driller:	NGE

Remarks: **Boring was noted as being dry during drilling and upon completion.**

Depth to Water @ 24 hrs.: ---

WV.DOT.LOG - LOGS.GPJ NGELOG.GDT 6/19/15



Project Name: **TGI Fridays
Bridgeport, West Virginia**
Project Number: **W15096**

**BORING NO.
N-4**

Elevation	Depth, feet	Sample Type	Symbol / USCS	Location: Offset:		Recovery %	RQD	Penetration Blows / 6 inches	HCSI	Moisture %	Silt and Clay %	Sand %	Liquid Limit	Plasticity Index
				Surface El.: 1208.2 ft.										
				<input type="checkbox"/> Split Spoon <input type="checkbox"/> Shelby Tube <input type="checkbox"/> Rock Core <input type="checkbox"/> Bag Sample										
MATERIAL DESCRIPTION														
1175	35			Brown and gray SILTY TO SANDY CLAY with many shale, siltstone, and sandstone rock fragments, moist, stiff to very stiff				5-7-10						
1170	40			-- FILL --				5-5-50/3"						
1165	45			Brown SILTY CLAY with rock fragments, moist, very stiff to hard				9-10-9						
1160	50			- with residual shale from 45.0 ft.				20-22-22						
1155	50.5			Brown SANDY SHALE , soft and weathered				50/5"						
				Bottom of Test Boring @ 50.5 ft.										

WV.DOT.LOG - LOGS.GPJ NGELOG.GDT 6/19/15

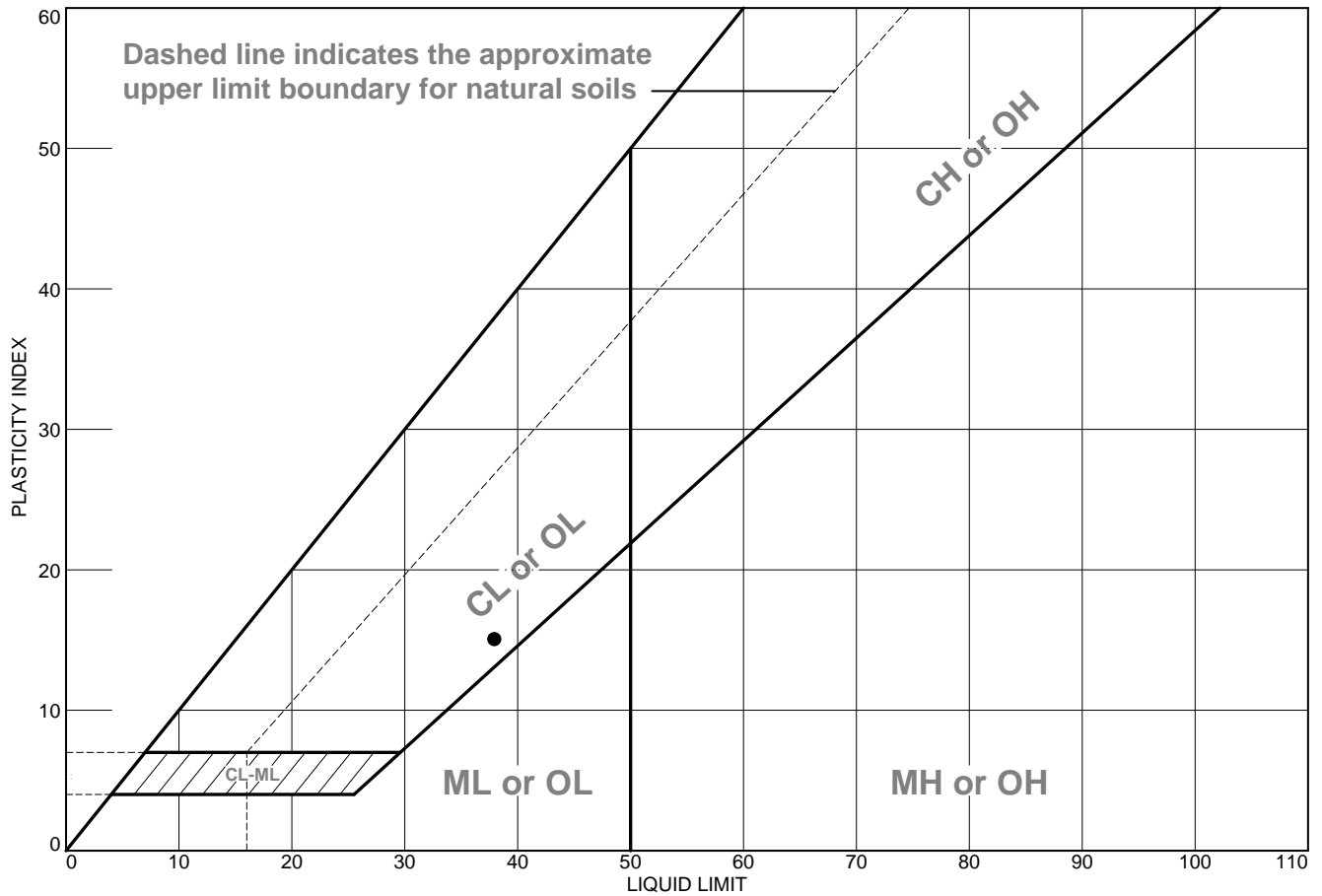
Completion Depth:	50.4 ft.
Date Boring Started:	6/3/15
Date Boring Completed:	6/3/15
Engineer/Geologist:	NLS
Driller:	NGE

Remarks: **Boring was noted as being dry during drilling and upon completion.**

Depth to Water @ 24 hrs.: ---

Appendix A

LIQUID AND PLASTIC LIMITS TEST REPORT



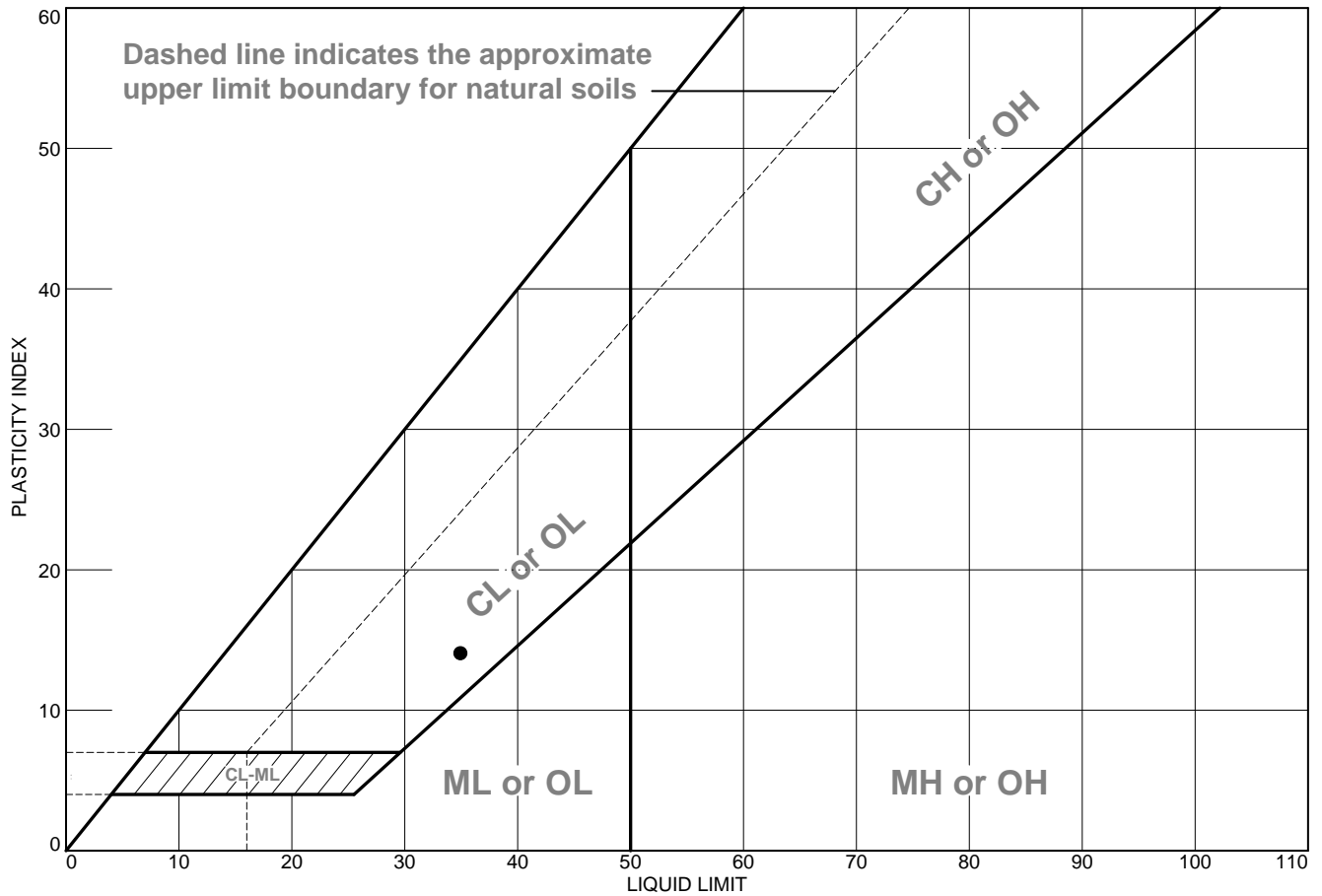
	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray SILTY CLAY w/rock fragments	38	23	15			

<p>Project No. W15096 Client: Thrasher</p> <p>Project: Bridgeport TGI Friday</p> <p>● Source of Sample: N-1 Depth: 5.0 - 6.5 ft. Sample Number: 3</p>	<p>Remarks:</p>
<p>NGE, LLC</p> <p>St. Albans, West Virginia</p>	

Figure

Tested By: JRD **Checked By:** CEM

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray SILTY CLAY w/rock fragments	35	21	14			

<p>Project No. W15096 Client: Thrasher</p> <p>Project: Bridgeport TGI Friday</p> <p>● Source of Sample: N-2 Depth: 5.0 - 6.5 ft. Sample Number: 3</p>	<p>Remarks:</p>
<p>NGE, LLC</p> <p>St. Albans, West Virginia</p>	

Figure

Tested By: JRD **Checked By:** CEM

SULFUR FRACTIONATION *

NGE CONSULTING

Project ID: W15096

Site ID: TGI FRIDAYS - BRIDGEPORT, WV

REIC Job #: 1506A79

Completed: 6/11/2015



Improving the environment, one client at a time...

Approved By: T.A. Keeney, Research Soil Scientist

REIC Sample Number	Client Sample Identification	Sample Collection Date	Total Sulfur (%)	Pyritic Sulfur (%)	Sulfate Sulfur (%)	Organic Sulfur (%)	Pyritic Sulfur of Total Sulfur (%)
01	B-3, 0.5 - 2.0 FT	6/3/2015	0.39	0.14	0.13	0.13	35.1%
02	B-5, 0.5 - 2.0 FT	6/3/2015	0.74	0.34	0.22	0.17	46.2%
03	B-13, 0.5 - 2.0 FT	6/3/2015	0.34	0.12	0.09	0.14	33.9%
04	N-1, 0.5 - 2.0 FT	6/4/2015	1.18	0.30	0.47	0.41	25.6%
05	N-2, 0.5 - 2.0 FT	6/4/2015	0.33	0.15	0.03	0.15	46.6%
06	N-3, 0.5 - 2.0 FT	6/3/2015	0.42	0.15	0.09	0.19	34.7%
07	N-4, 0.5 - 2.0 FT	6/3/2015	0.06	-	-	-	-

* ASTM D2492-84 and EPA-600 / 2-78-054, Section 3.2.6 (Modified)
Minimum Qualifying Limit (MQL) - 0.01

SECTION 01100

SUMMARY

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Title of Work, and type of Contract.
 - 2. Definitions.
 - 3. Contractor's Duties.
 - 4. Contract Method.
 - 5. Work by Others.
 - 6. Owner-Furnished Items.
 - 7. Corporate pricing with national vendors.
 - 8. Construction Handbook.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of this Contract comprises general construction of a new T.G.I Friday's Restaurant located at 160 S. View Drive, Bridgeport, WV, approximately 6,206 square feet, including related site work, landscaping, architectural, structural, mechanical, electrical and plumbing, for the Owner, Moe and Jerry's, LLC.

1.3 DEFINITIONS

- A. Owner: Moe and Jerry's, LLC
- B. Architect: Damon A Drennan
- C. Construction Manager: TBD

1.4 CONTRACTOR'S DUTIES

- A. Except as specifically noted, provide and pay for:
 - 1. Labor, materials and equipment.
 - 2. Tools, construction equipment, and machinery.
 - 3. Water, heat, and utilities required for construction.
 - 4. Other facilities and services necessary of proper execution and completion of work.
 - 5. Coordinate, supervise and install all final utility connections. Coordinate with Owner all utility applications. All tap on fees related to final utilities are to be paid by the general contractor and reimbursed by Owner.
- B. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids:
 - 1. Government Fees including inspection fees.
 - 2. Licenses.
 - 3. The Owner will be responsible for obtaining the general construction permit unless otherwise indicated.
- C. Pay legally required sales, consumer, income and use taxes.
- D. Give required notices.
- E. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of Work, including all provisions of the Occupational Safety and Health Administration, and including Article 1926.21 (Safety Training and Education) and Americans with Disabilities Accessibility Guidelines.

- F. Promptly submit written notice to Owner of observed variance of Contract Documents from legal requirements. Assume responsibility for Work known to be contrary to such requirements, without notice.
- 1.5 CONTRACT METHOD
- A. Construct the Work under a single lump sum contract.
 - B. Owner reserves the right to award other contracts for additional work in connection with this Project as required to install improvements, furnish or equip the building.
- 1.6 WORK BY OTHERS
- A. Work of the Project which will be executed after or near completion of Work of this Contract, and which is specifically excluded from this Contract, except electrical requirements and conduit as indicated on Drawings:
 - 1. Computer systems.
 - 2. Telephone systems.
 - 3. Security systems.
 - 4. Cable television systems.
 - B. Items Furnished by Owner For Final Connection by Contractor:
 - 1. Refer to Section 01640.
- 1.7 CONTRACTOR USE OF PREMISES
- A. Limit use of premises for Work, for storage, and for access, to allow for:
 - 1. Partial occupancy by Owner.
 - 2. Work by other contractors.
 - B. Coordinate use of premises under direction of Owner.
 - C. Assume full responsibility for protection and safekeeping of products under this Contract.
 - D. Obtain and pay for use of additional storage or work areas needed when required for operations under this Contract.
- 1.8 PARTIAL OWNER OCCUPANCY
- A. Before the entire completion of the Work, allow Owner to take possession and use of any completed or partially completed portion of the Work, or to place and install as much of its own furniture and equipment during the progress of the work as is possible without interference. Such possession and use of the premises or Work or such placing and installation of equipment, or both, shall not in any way evidence completion of the Work or any part thereof.
 - B. After the specified time of completion, it shall be understood that the Owner will not be liable for any inconvenience caused the Contractor by the Owner's occupancy.
 - C. Execute Certificate of Substantial Completion for each designated portion of Work prior to Owner occupancy.
 - D. At time of Owner occupancy, allow:
 - 1. Access for Owner personnel.
 - 2. Use of parking facilities.
 - 3. Operation of HVAC and electrical systems.
- 1.9 OWNER-FURNISHED PRODUCTS
- A. Refer to Section 01640.
- 1.10 CORPORATE PRICING WITH NATIONAL VENDORS
- A. The Owner has secured pricing with national vendors for certain products used in this project. Vendor information is provided in the applicable section of the specifications.
 - B. Contractor is responsible to contact each applicable vendor and to provide the products under this contract.

1.11 START-UP REQUIREMENTS

- A. Submit the following items to the Owner prior to the commencement of work.
 - 1. Original of the Performance and Payment Bonds executed in conformance with AIA Form 311.
 - 2. Summary of insurance for the project on AIA Form G705. Ensure TGI Friday's is named as co-insured.
 - 3. Copy of Building Permit.
 - 4. Copy of Notice of Commencement, when required by local codes. If not required by local codes, a letter certifying that fact will be accepted in lieu of the notice.
 - 5. List of major subcontractors and suppliers, each identified by trade name, address, contact person and telephone number.
 - 6. Copy of State and/or City license, when required by local codes. If not required by local codes, a letter certifying that fact will be accepted in lieu of either license.
 - 7. Gant chart of anticipated construction schedule indicating TGIF delivery dates.
 - 8. Written plan of action for addressing proper execution of warranty issues for the full warranty period if Contractor's office is not located in same city as construction project.
 - 9. Project superintendent's name and project history indicating ability to effectively manage the project.
 - 10. Installation of temporary construction sign. Refer to Section 01580.
 - 11. Installation of temporary construction mailbox. Refer to Section 01500.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01230

ALTERNATES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Identification and description of Alternate work.

1.2 PROCEDURES

- A. Bidders are required to submit Alternate Bids to add work or to deduct work from the Base Bid as described below. Failure to submit Alternate amounts in spaces provided on Bid Form is basis for disqualification of Bid.
- B. The successful Bidder shall not modify, withdraw or cancel any of the Alternate Bids or any part thereof for 60 days after date of receipt of Bids, unless specifically noted otherwise.
- C. Contractor shall be responsible for any changes in the work affected by acceptance of these Alternates. Claims for extras resulting from changes caused by the Alternates will not be allowed.
- D. Refer to Drawings and Technical Specifications Sections for items of work affected by Alternates.
- E. Alternates will be exercised at the option of Owner.
- F. Coordinate related work and modify surrounding work as required to complete the Work, including changes under each Alternate, when acceptance is designated in Owner-Contractor Agreement.

1.3 SELECTION AND AWARD OF ALTERNATES

- A. Indicate variation of Bid Price for Alternates described below and list in Bid Form Document or any supplement to it, which requests a 'difference' in Bid Price by adding to or deducting from the base bid price or by indicating "No Charge".
- B. Indicating "No Bid" as an alternate is unacceptable and is reason for rejection of bid.

1.4 ALTERNATE NO. 1 [Description]

- A. State in Bid Form the amount to be added to or deducted from the Base Bid for providing [Fill in Description of Alternate #1]

1.5 ALTERNATE NO. 2 [Description]

- A. State in Bid Form the amount to be added to or deducted from the Base Bid for providing [Fill in Description of Alternate #1]

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01250

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Procedures for processing contract modifications including change orders.

1.2 SUBMITTALS

- A. Submit documents, questions, and submittals pertaining to Change Orders to Owner's Construction Manager.
- B. Submit name of individual authorized to accept changes, and to be responsible for informing others in Contractor's employ of changes in the Work.
- C. Submit names of individuals responsible for informing Contractor's employees and affected subcontractors of Contract clarifications and modifications.

1.3 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. On request, provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work done on a time and material basis, with additional information
 - 1. Origin and date of claim.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.4 CHANGE PROCEDURES

- A. Minor Changes in Work:
 - 1. Construction Manager will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by General Conditions by issuing supplemental instructions on Architect's Supplemental Instructions (ASI), AIA Document G710.
 - 2. Procedure: Document is prepared and signed by Architect and distributed to Contractor. Supplemental Instructions are effective upon receipt by Contractor.
 - 3. Changes are to be made immediately with no changes to Contract Sum or Contract Time.
- B. On-Site Work Authorization (OSWA)
 - 1. Form: On-Site Work Authorization
 - 2. Description: Written authorization made in the field to perform the stated work as soon as possible. If it includes any changes in the Contract Sum or Contract Time, a not to

exceed cost will be determined upon issuing the OSWA and the amount will be included in the form.

3. Procedure:
 - a. Document is prepared, issued, and signed only by Owner and Owner's Construction Manager.
 - b. If verbal approval is made, then confirm and document the approval in writing within 10 days of the approval.
 - c. Contractor submits a Change Order Proposal. The OSWA becomes a part of the Contract Documents only by an approved Change Order.
- C. Proposal Request:
 1. Form: Proposal Request (PR)
 2. Description: Written proposed change of Work within Contract scope consisting of additions, deletions, and other revisions. Proposal Request is for information only and does not authorize changes in Contract Sum or Contract Time. Contractor evaluates proposal for pricing and scheduling impact.
 3. Procedure:
 - a. Document is prepared and signed by Architect. Copies are sent to Contractor.
 - b. Contractor shall review Proposal Request and submit Change Order Proposal with backup material and documentation and proposed changes in Contract Sum and Contract Time.
 - c. Prepare and submit Change Order Proposal to Owner's Construction Manager within 10 days of Proposal Request receipt. Proposed Contract Sum and Contract Time changes quoted by Contractor shall remain valid for 30 days from receipt by Owner's Construction Manager. If the Change Order Proposal is not received within 10 days of the Proposal Request, Contract agrees that any modifications in the Proposal Request will be completed with no change in the Contract Sum or Contract Time.
- D. Change Order Proposal:
 1. Form of Request: Change Order Proposal (COP), TGIF Form.
 2. Description: Written proposed change of Work consisting of additions, deletions, and other revisions. Submit Change Order Proposal to Owner's Construction Manager for conditions that require Contract Document modifications. Include proposed changes in Contract Sum and Contract Time. Includes
 - a. Summary of labor, materials, overhead and profit, bonds, insurance, and tax of proposed Contract additions and deductions.
 - b. Summary labor and material costs of each subcontractor involved in proposed change.
 - c. Written authorization to proceed in the form of an approved and signed ASI, PR, or OSWA.
 - d. Copies of invoices substantiating material costs.
 - e. Hourly rate per trade supporting labor costs.
 3. Procedure:
 - a. Proposed changes are documented by Contractor on Change Order Proposal form. Documents include description of proposed changes and summary of changes in Contract Sum and Contract Time are prepared and signed by Contractor. Submit copies to Owner's Construction Manager.
 - b. Comply with requirements of Section 01600 for proposed changes in Work that includes products or systems not contained in Contract Documents.
 - c. Owner's Construction Manager will review Change Order Proposal and evaluate proposed changes. Owner's Construction Manager may accept or reject Change Order Proposal. Upon acceptance of COP, Owner's Construction Manager will prepare Change Order to document Contract change.
 - d. Contractor shall perform changes upon receipt of signed COP.
- E. Change Order:
 1. Form: Change Order (CO)

2. Description: Written change of Work within Contract scope consisting of additions, deletions, and other revisions, including proposed basis for adjustment to Contract Sum and Contract Time. Change Orders are signed by Contractor and Owner.
3. Procedure: Document is prepared by Owner's Construction Manager, sent to Contractor for acceptance and signature; sent to Owner for acceptance and signature; distributed to Architect, Owner, and Contractor.
4. Contractor may request payment for items included on an approved Change Order on the Application for Payment following the Change Order approval.

1.5 LUMP SUM CHANGE ORDER

- A. Based on Change Order Proposal and Contractor's sum quotation, as approved by Owner and Owner's Construction Manager.

1.6 UNIT PRICE CHANGE ORDER

- A. For predetermined unit prices and quantities, Change Order will be executed on a lump sum basis.
- B. For unit costs or quantities of units of work, which are not predetermined, execute Work and utilize standard Public Works prices. Changes in Contract Sum or Contract Time will be computed as specified for time and material Change Order.

1.7 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum as shown on Change Order.
- B. Promptly revise Progress Schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01290

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Procedures for preparation and submittal of applications for payment.
 - 2. Procedures for preparation and submittal of the Schedule of Values.

1.2 APPLICATION FOR PAYMENT

- A. General:
 - 1. Maintain consistency with previous applications for payments as certified by Owner and paid by Owner.
 - 2. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
 - 3. Payment Application Times: Each progress payment date is as indicated in Agreement. Work covered by each Application for Payment is period indicated in Agreement.
- B. Format:
 - 1. AIA G702 - Application and Certificate for Payment.
 - 2. AIA G703 - Continuation Sheet.
- C. Preparation of Applications:
 - 1. Type required information or use media-driven printout.
 - 2. Execute certification by signature of authorized officer.
 - 3. Use data on accepted Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
 - 4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
 - 5. Prepare Initial Application for Payment and Application for Payment at time of Substantial Completion as specified below.
 - 6. Prepare final Application for Payment as specified below and in Section 01770.
- D. Submittal Procedures:
 - 1. Submit one original copy of each Application for Payment to Owner.
 - 2. Include completed, signed forms, notarized as applicable, with each copy of Application for Payment. Refer to TGI Friday's Construction Handbook for TGIF documents.
 - a. General Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706.
 - b. Subcontractor/Supplier Payment Summary, TGIF Document.
 - c. Contractor's Affidavit of Partial Release of Liens, TGIF Document.
 - 3. Submit under transmittal letter specified in Section 01330.
 - 4. Payment Period: Submit to Owner at times stipulated in Agreement ensuring receipt within 24 hours and no later than the 25th day of the month.
 - 5. Submit lien waivers with each Application for Payment.
 - 6. Submit construction photographs. Refer to Section 01320.
- E. Waivers of Mechanics Lien:
 - 1. With each Application for Payment submit waivers of mechanics liens from subcontractors and suppliers for construction period covered by previous application.
 - 2. Submit partial waivers on each item for amount requested, prior to deduction for retainage, on each item.

3. When application shows completion of item, submit final or full waivers.
 4. Owner reserves right to designate which entities involved in Work must submit waivers.
 5. Waiver Forms: Submit waivers of lien on properly executed Waiver of Lien.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Values.
 4. Construction Progress Schedule, preliminary if not final.
 5. Schedule of principal products.
 6. Schedule of unit prices.
 7. Submittal schedule.
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from governing authorities for performance of Work.
 12. Initial progress report.
 13. Report of pre-construction meeting.
 14. Certificates of insurance and insurance policies.
 15. Partial release of liens.
- G. Application for Payment at Substantial Completion:
1. Following issuance of Certificate of Substantial Completion, submit Application for Payment reflecting Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work.
 2. Required administrative actions and submittals that precede or coincide with this application include:
 - a. Occupancy permits and similar approvals.
 - b. Warranties and maintenance agreements (dated to commence on date of Substantial Completion).
 - c. Test/adjust/balance records.
 - d. Maintenance instructions.
 - e. Meter readings.
 - f. Start-up performance reports.
 - g. Change over information related to Owner's occupancy, use, operation and maintenance.
 - h. Advice on shifting insurance coverage.
 - i. Final progress photographs.
 - j. Comprehensive list of incomplete or non-complying Work (initial punch list).
 - k. Partial release of liens.
 - l. Sworn Statement by Contractor.
- H. Final Payment Application: Required administrative actions and submittals which precede or coincide with submittal of final Application for Payment include following:
1. Completion of Project Closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Assurance that unsettled claims will be settled.
 4. Assurance that Work not complete and accepted will be completed without undue delay.
 5. Final cleaning.
 6. Transmittal of required Project construction records to Owner.
 7. Certified property survey.
 8. Proof that taxes, fees and similar obligations have been paid.
 9. Removal of temporary facilities and services.
 10. Removal of surplus materials, rubbish and similar elements.
 11. Change of door locks to Owner's access.

12. Sworn Statement by Contractor.
13. Full Waiver of Lien from Contractor for full amount of Contract.
14. Full Waivers of Lien from each subcontractor.
15. Contractor Guarantee.
16. Subcontractor Guarantees.
17. [Consent of Surety to Final Payment.]

1.3 SCHEDULE OF VALUES

- A. Format:
 1. Type Schedule on AIA Document G703 - Continuation Sheet for Application and Certificate for Payment, or use media driven printout upon prior approval.
 2. Follow Table of Contents of Project Manual for listing component parts. Identify each line item by number and title of major Specifications section.
- B. Content:
 1. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
 2. For each major subcontract, list products and operations of that subcontract as separate line items.
 3. List allowances in the specified monetary amount for each allowance.
 4. Coordinate listings with Progress Schedule.
 5. Include a directly proportional amount of Contractor's general office overhead and profit for each component listing. Use separate line for bonds, insurance, temporary facilities and controls, and superintendence.
 6. Sum of values listed equals total Contract Sum.
- C. Submittal:
 1. Submit 3 copies of Schedule 15 days prior to first Application for Payment.
 2. Transmit under Owner's accepted form transmittal letter. Identify Project by title and number.

1.4 SUBSTANTIATING DATA

- A. When Owner requires substantiating information, submit data justifying line item amounts in question.
- B. On allowance items, submit actual invoice from supplier of product or service.
- C. Provide one copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01310

PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Coordination of Work of the Contract.
 - 2. Pre-construction conferences.
 - 3. Scheduling and administration of progress meetings.
 - 4. Pre-installation conferences.

1.2 DESCRIPTION

- A. Coordinate scheduling, submittals, and work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

1.3 GENERAL COORDINATION PROVISIONS

- A. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect of any error, inconsistency, omission, or apparent discrepancy discovered.
- B. Allot time in construction scheduling for liaison with Architect, establish procedures for handling queries and clarifications. Use Request for Information, TGIF Form.
- C. If Architect is able to respond to a request for information by making specific reference to Drawing sheet or Specification Section, Contractor shall reimburse Owner for charges of Architect and Architect's Consultants for performing review services for the Contractor.
- D. In addition to meetings specified herein, hold coordination meetings and conferences with personnel and subcontractors to ensure coordination of Work.
- E. Coordinate scheduling, submittals, and Work of various Specification sections to avoid conflicts and ensure efficient and orderly sequence of installation of interdependent construction elements.
- F. Coordinate Work of various Specification sections having interdependent responsibilities for installation, connection, and operation.
- G. Verify that characteristics of operating equipment are compatible with building utilities and services.
- H. Except as otherwise indicated, conceal pipes, ducts, conduit and wiring in construction. Coordinate locations of fixtures and outlets with finish elements.
- I. Make provision to accommodate items scheduled for later installation.

1.4 MEETINGS

- A. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and subcontractors to assure coordination of Work.

1.5 COORDINATION OF SUBMITTALS

- A. Schedule and coordinate submittals specified in Section 01330.
- B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

1.6 COORDINATION OF SPACE

- A. Coordinate use of Project space and sequence of installation of mechanical, and electrical work which is indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- B. In finished areas except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- C. Layout of plumbing, fire protection, mechanical, and electrical systems, equipment, fixtures, piping, ductwork, conduit, specialty items, and accessories indicated on Drawings is diagrammatic. Variations in alignment, elevation, and details required to avoid interferences and satisfy architectural and structural limitations are not necessarily shown.
- D. Prior to installation of material and equipment, review and coordinate Work with Architectural and Structural Drawings to establish exact space conditions. Where available space is inadequate or where reasonable modifications are not possible, request information from Architect before proceeding and with sufficient time for the Architect to research a solution and respond.
- E. Coordinate installation to prevent conflicts and cooperate in making, without extra charge, reasonable modifications in layout as needed.
- F. Provide clear access to control points, valves, strainers, control devices, and specialty items of every nature related to such systems and equipment to obtain maximum head room. Provide adequate clearances as necessary for operation and maintenance.

1.7 COORDINATION OF CONTRACT CLOSEOUT

- A. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion of portions of Work designated for Owner partial occupancy.
- B. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- C. Assemble and coordinate closeout submittals specified in Section 01780.

1.8 PRECONSTRUCTION CONFERENCE

- A. Owner's Construction Manager will schedule conference within 15 days after notice of award.
- B. Attendance: Owner's Construction Manager, Contractor and representatives of major subcontractors, and others as appropriate.
- C. Owner's Construction Manager presides over meeting and is responsible for recording and distributing minutes.
- D. Agenda
 - 1. Submittal of executed bonds and insurance certificates.
 - 2. Execution of Owner-Contractor Agreement.
 - 3. Distribution of Contract Documents.
 - 4. Submittal of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of responsible personnel.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, change orders, and Contract closeout procedures.
 - 7. Deliveries and Construction Checklist.
 - 8. Use of premises by Owner and Contractor.
 - 9. Owner's requirements and occupancy.
 - 10. Review of owner provided items and contractor's responsibilities
 - 11. Temporary facilities.
 - 12. Survey and building layout.
 - 13. Security and housekeeping procedures.
 - 14. Schedules.
 - 15. Procedures for testing.
 - 16. Procedures for maintaining record documents.

17. Requirements for startup of equipment.
18. Inspection and acceptance of equipment put into service during construction period.

1.9 PROGRESS MEETINGS

- A. Schedule and administer weekly construction progress meetings, throughout progress of Work.
 1. Prepare agenda and distribute notice of each meeting to participants.
 2. Make physical arrangements.
 3. Preside at meetings, record minutes, and distribute copies after meeting to participants, and to entities affected by decisions at meetings.
 4. Distribute one copy of minutes to Owner's Construction Manager.
 5. Maintain in field office one copy of agenda and minutes for each conference and meeting.
- B. Location of Meetings: Contractor's field office.
- C. Attendance: Contractor, job superintendent, subcontractors, and suppliers as appropriate to agenda; Architect, and professional consultants as appropriate.
- D. Anticipated Agenda
 1. Approval of minutes of previous meeting.
 2. Work progress since previous meeting:
 - a. Current activities.
 - b. Critical activities.
 - c. Deviations from schedule.
 3. Field observations, problems, conflicts, and decisions.
 4. Deficiencies:
 - a. Identification of items.
 - b. Status of correction.
 5. Requests for Information (RFIs):
 - a. Status of clarification.
 - b. Status of proposal requests.
 6. Changes and Modifications:
 - a. Status of change orders.
 - b. Pending changes.
 - c. Pending claims and disputes.
 - d. Clarification decisions of Owner's Construction Manager.
 7. Problems and conflicts that impede planned progress.
 8. Construction Progress and Submittal Schedules:
 - a. Off-site fabrication and delivery schedules.
 - b. Effect of proposed changes on construction progress schedule and coordination.
 - c. Submittal schedules, status of submittals, and effect on construction progress schedule.
 - d. Corrective measures to regain projected schedule.
 9. Planned progress during succeeding Work period.
 10. Adequacy of work forces.
 11. Coordination between elements of Work.
 12. Maintenance of Project Record Documents.
 13. Other business relating to progress of Work.
- E. Meeting Minutes:
 1. Include column to indicate who is required to take action and date action is to be completed. Each of these items requiring action will be carried in subsequent minutes of meeting as "old business" until noted as "resolved."
 2. As minimum, separate into following categories:
 - a. Old business.
 - b. New business.
 - c. Work progress.
 - d. Deficiencies.

- e. RFIs.
- f. Proposed changes.
- g. Schedules.
- h. Submittals.
- i. Other business, including events to be accomplished by next meeting.

1.10 PRE-INSTALLATION CONFERENCES

- A. Schedule pre-installation conferences required in individual Specification sections. Convene at Project site prior to commencing Work of the section.
- B. Attendees:
 - 1. Project superintendent; presides over meeting and is responsible for minutes.
 - 2. Subcontractor (installer, applicator, or erector).
 - 3. Material or equipment supplier.
 - 4. Manufacturers' representative.
 - 5. Others directly affecting, or affected by the work.
 - 6. Testing agency (if necessary).
 - 7. Subcontractors, as appropriate.
 - 8. Architect and professional consultants may attend as appropriate.
 - 9. Others as appropriate to agenda.
- C. Notify Owner's Construction Manager minimum 4 days in advance of meeting date.
- D. Minimum Agenda:
 - 1. Access to work and conditions of proper installation.
 - 2. Conditions of installation, such as substrates, existing and surrounding conditions, and environmental conditions.
 - 3. Conditions detrimental to installation.
 - 4. Preparation procedures, including protection of adjacent work.
 - 5. Verify installers' receipt and understanding of installation instructions.
 - 6. Review submittals, installation procedures, and sequence.
 - 7. Review coordination with other work.
 - 8. Evaluate delivery schedule and Construction Progress Schedule.
 - 9. Observe sample installation.
 - 10. Required protection procedures.
- E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.11 CLOSEOUT CONFERENCE

- A. Schedule Project Closeout conference prior to requesting Substantial Completion.
- B. Attendees:
 - 1. Contractor; presides over meeting and is responsible for minutes.
 - 2. Major subcontractors.
 - 3. Architect and professional consultants may attend as appropriate.
 - 4. Others as appropriate to agenda.
- C. Minimum Agenda:
 - 1. Start-up of facilities and systems.
 - 2. Testing, adjusting, and balancing.
 - 3. System demonstration and observation.
 - 4. Operation and maintenance instructions for the owner's personnel.
 - 5. Contractor's inspection of work.
 - 6. Contractor's preparation of an initial "punch list."
 - 7. Procedure to request Owner's inspection to determine date of substantial completion.
 - 8. Completion time for correcting deficiencies.
 - 9. Inspections by authorities having jurisdiction.
 - 10. Certificate of occupancy and transfer of insurance responsibilities.
 - 11. Partial release of retainage.
 - 12. Preparation for final inspection.
 - 13. Closeout submittals:

- a. Project Record Documents.
- b. Operating and maintenance documents.
- c. Operating and maintenance materials.
- d. Warranties and bonds.
- e. Affidavits.
14. Final application for payment.
15. Final cleaning.
16. Contractor's demobilization of site.
17. Maintenance.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Procedures for preparation and submittal of construction Progress Schedules and periodical updating.
 - 2. Construction photography.

1.2 PROGRESS SCHEDULES

- A. Format:
 - 1. Submit a computer generated horizontal bar chart (gant chart) with separate line for each section of Work, identifying first workday of each week.
- B. Sequence of Listings: The chronological order of the start of each item of Work.
- C. Scale and Spacing: To provide space for notations and revisions.
- D. Sheet Size: Minimum 11 by 17 inches.
- E. Content:
 - 1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
 - 2. Identify each item by major Specification section number.
 - 3. Indicate the early and late start, early and late finish, float dates, and duration.
 - 4. Identify work of separate stages, if applicable, and other logically grouped activities.
 - 5. Provide sub-schedules to define critical portions of entire Schedule.
 - 6. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
 - 7. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates
 - 8. Show decision dates for selection of finishes.
 - 9. Show delivery dates for Owner-Furnished products and products specified under Allowances, if applicable.
 - 10. Coordinate content of Schedule of Values specified in Section 01290.
- F. Revisions to Schedules:
 - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
 - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
 - 3. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.
 - 4. Revise as necessary to coordinate with weekly issue of Owner's Construction Delivery Schedules for Owner-Provided products.
 - a. Changes may be made if request is made within the first 2 weeks from start of construction and approval is given by Owner's Construction Manager.
 - b. Absolutely no changes in the Owner delivery dates will be allowed if requested less than 2 weeks prior to the scheduled delivery date.
- G. Distribution:
 - 1. Distribute copies of Schedules reviewed by Owner's Construction Manager to job site file, subcontractors, suppliers, and other concerned entities.
 - 2. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

1.3 CONSTRUCTION PHOTOGRAPHS - DIGITAL

- A. Provide digital photographs of site and construction throughout progress of Work.

- B. Take a minimum of 10 photographs each week throughout the progress of the work, and contain, as a minimum, the following elements.
 - 1. Site clearing.
 - 2. Excavations.
 - 3. Foundations.
 - 4. Structural framing.
 - 5. Enclosure of building.
 - 6. Final completion.
- C. Medium:
 - 1. Full color, digital format.
 - 2. Identify each photo electronically by listing name of project, phase, orientation of view, and date and time of view.
- D. Technique:
 - 1. Provide factual presentation.
 - 2. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- E. Views:
 - 1. Provide non-aerial photographs from a sufficient number of views at each specified time in order to sufficiently document the progress of the work, until Date of Substantial Completion. Include a minimum of 3 interior views including bar and kitchen, and 4 exterior views including one of each exterior elevation.
 - 2. Consult with Owner's Construction Manager for instructions on additional views required.

1.4 SUBMITTALS

- A. Progress Schedule:
 - 1. Submit initial Schedules within 15 days from Notice to Proceed. After review, resubmit required revised data within 15 days.
 - 2. Submit revised Progress Schedules with each Application for Payment.
 - 3. Submit the number of opaque reproductions that Contractor requires, plus 2 copies retained by Owner's Construction Manager.
 - 4. Submit under transmittal letter specified in Section 01330.
- B. Construction Photographs:
 - 1. Deliver digital photographs via electronic mail at same time as each Weekly Progress Report. Follow-up with digital photographs on computer disk or online storage media, as agreed upon with Friday's Construction Manager at start of project, within 2 days.

1.5 WEEKLY PROGRESS REPORTS

- A. Submit in Owner required format on a weekly basis.
- B. Submit to Owner's Construction Manager at the end of each week.

1.6 WEEKLY MANPOWER BREAKDOWN

- A. Indicate manpower at project site on a daily basis for each trade.
- B. Form: Weekly Manpower Breakdown, TGIF Form.
- C. Submit via email or facsimile copies to Owner's Construction Manager at the end of each week.

1.7 DAILY CONSTRUCTION REPORTS

- A. Form: Daily Construction Report, TGIF Form.
- B. List major deliveries.
- C. Indicate weather conditions.
- D. Outline progress made at the site.
- E. Submit via email or facsimile copies to Owner's Representative at the end of each week.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Submittal procedures.
 - 2. Proposed products list.
 - 3. Shop drawings.
 - 4. Product data.
 - 5. Samples.
 - 6. Manufacturers' instructions.
 - 7. Manufacturers' certificates.
 - 8. Schedule of submittals.

1.2 DEFINITIONS

- A. Shop Drawings: Include drawings, diagrams, schedules and other data specially prepared for the Work by Contractor or a subcontractor, sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- B. Product Data: Include illustrations, standard schedules, performance charts, instructions, brochures, diagrams, test data and other information furnished by Contractor to illustrate material, product or system for some portion of the Work.
- C. Samples: Physical examples illustrating materials, equipment or workmanship and establish standards by which the Work will be judged. Samples include field samples.
- D. Quality Control Submittals: Pertain to quality control and Owner information that do not require review and approval by Architect and are to be retained for project file only. If reviewed, project information will be reviewed for compliance with the Contract Documents only. The review will not constitute a detailed review of adequacy of submitted design calculations. The appropriateness and accuracy of calculations is the responsibility of the submitting Contractor (and Contractor's professional engineer when such calculations are required to be professionally sealed). Examples of quality control submittals:
 - 1. Design data and calculations.
 - 2. Test reports.
 - 3. Certifications.
 - 4. Manufacturer's installation instructions.
 - 5. Manufacturer's field reports.
- E. Contract Closeout Submittals: Pertain to contract closeout related information that do not require review and approval by the Architect and are to be retained for project file only. Examples of contract closeout submittals:
 - 1. Project record information.
 - 2. Warranties.
 - 3. Operation and maintenance data.
 - 4. Owner instruction reports.
- F. Administrative Submittals: Refer to General and Supplementary Conditions for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of Subcontractors.

6. Schedule of Values.

1.3 GENERAL REQUIREMENTS

- A. Submit number of copies of product data and manufacturer's instructions in quantities shown:
 - 1. Manufacturer's data and literature: Five copies, 3 to be returned.
 - 2. Shop Drawings: Two sets of paper prints, 1 to be returned.
 - 3. Samples: Five physical samples of each type and color submitted to Architect; 3 to be returned.
- B. Products, except those listed in the Schedule at the end of this Section, that will be provided as specified will require a letter from the Contractor indicating such.
- C. Submit under Architect's accepted form transmittal letter. Identify Project by title and number. Identify Work and product by Specification section and Article number.
 - 1. Submit copy of transmittal to Architect.
- D. Provide complete submittals for each specified product, system or equipment. Partial or incomplete submittals will be returned, without review, for re-submission.
- E. Schedule submittals to expedite Project in accordance with approved Construction Progress Schedules and in such sequence as to cause no delay in the Work or in the activities of Owner or of separate contractors.
 - 1. Make submittals within 4 weeks of award of contract.
- F. Deliver submittals to Architect's office. Submittals accepted only from Contractor.
- G. Submit product data, shop drawings, samples, calculations, certificates, manufacturer's instructions, and other items requested within each specification section.
- H. Number submittals using Specification section number and unique numeric reference number. Indicate reference number of previous submission for resubmittals. For example, Specification Section - 08710; Reference Number - 02; previous Reference Number - 01.
- I. Identify Project, Contractor, subcontractor or supplier, pertinent Drawing sheets and detail numbers, and Specification section number, as appropriate.
- J. Apply Contractor's stamp, sign or initial and date certifying that review, verification of products, field dimensions, adjacent construction Work, product lead time, and coordination of information, is in accordance with requirements of Work and Contract Documents.
- K. Submittals will be returned without processing if they have not been reviewed and stamped by Contractor for coordination of work and conformance with the Drawings and Specifications prior to submission to Architect, if they are not initialed or signed by authorized person, if they are not dated, or if it becomes evident that they have not been properly reviewed. Delays resulting therefrom are not responsibility of Architect.
- L. Clearly identify on submittals, or in writing at time of submission, deviations in submittals from requirements of Contract Documents.
- M. Do not perform Work on any element requiring submittal and review of shop drawings, product data, samples, or other similar submittals until respective submittal has been approved by Architect.
- N. Maintain in field office a copy of submittal schedule and log of submittals indicating current status of each item.
- O. Prepare submittals using the same units of measurement system (metric or inch-pound) in compliance with requirements stated in Section 01450. Use ASTM E 380 and E 621 for establishing metric measurements used in submittals.

1.4 PROPOSED PRODUCTS LIST

- A. Refer to Section 01600.

1.5 SHOP DRAWINGS

- A. Transmittal:
 - 1. Submit in accordance with approved Progress Schedule and in such sequence to avoid delay in the Work or work of other contracts.
 - 2. Submit each with form attached.

3. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
 4. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
 5. Provide 8 by 4 inch blank space on each submittal for Architect's stamp and Engineer's stamp as applicable.
 6. Submit in the form of two opaque reproductions.
- B. Schedule submittals to expedite the Project, and deliver to Architect at business address.
 - C. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
 1. Finishes that involve Architect's selection of colors, textures, or patterns.
 2. Associated items that require correlation for efficient function or for installation.
 - D. Present in a clear and thorough manner original drawings that illustrate the portion of the work showing fabrication, layout, setting, or erection details, prepared by a qualified detailer. Title each drawing with Project and Contract name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
 - E. Check and coordinate shop drawings of any section or trade with requirements of other sections or trades and as necessary for proper coordination and complete installation of Work.
 - F. Do not use Contract Drawings for shop drawings. Provide original shop drawings with changes from Contract Drawings clearly indicated.
 - G. Show layout, details, materials, dimensions, thicknesses, methods of assembly, attachments, relation to adjoining Work, wiring diagrams, rough-in requirements, and other pertinent data and information. Submit detail drawings of special accessory components not included in manufacturer's product data.
 - H. Identify field dimensions; show relation to adjacent or critical features of Work or products.
 - I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
 - J. Existing Conditions:
 1. Show locations of existing conditions that affect installation of new Work.
 2. Show details of existing conditions and proposed modifications as requested by Architect or Owner's Construction Manager.
 - K. Revise and resubmit submittals as required, identify all changes made since previous submittal.
 - L. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.6 CHANGED CONDITION DRAWINGS

- A. When specified in individual Sections, submit changed condition drawings in same quantities as for shop drawings.
- B. Where conditions differ from Contract Documents or shop drawings and remedial work is necessary, submit drawing showing changes.
- C. Submit drawing bearing seal and signature of professional engineer responsible for design.
- D. Indicate differing condition and required work caused by differing condition.

1.7 CALCULATIONS

- A. When specified in individual Sections, submit calculations.
- B. Submit engineering calculations for component sizes, deflections, and connections.
- C. Submit calculations bearing seal and signature of registered professional engineer responsible for design.
- D. Where existing conditions deviate from Contract Documents or shop drawings, submit calculations for existing condition, including calculations for anticipated corrective action required, and changes to loads transferred to "base building" structure.

1.8 PRODUCT DATA

- A. Transmittal:
 - 1. Submit under Architect's accepted form transmittal letter. Identify Project by title and number. Identify Work and product by Specification section and Article number.
 - 2. Submit the number of copies that the Contractor requires, plus 2 copies that will be retained by Architect and Construction Manager.
- B. Submit only pages that are pertinent.
 - 1. Mark each copy of standard printed data to identify pertinent products, models, options, and other data referenced to Specification Section and Article number.
 - 2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
 - 3. Modify manufacturer's standard data, schematic drawings, and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- C. After review, distribute copies of reviewed product data to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.9 SAMPLES

- A. Transmittal:
 - 1. Label each sample with identification required for transmittal letter with full Project information.
 - 2. Submit the number of samples specified in individual specification Sections; one of which will be retained by Architect and Owner's Construction Manager.
 - 3. Submit number of samples specified in individual Specifications sections.
- B. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- C. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.
- D. Where custom colors are specified, submit samples illustrating colors, textures, patterns, and finishes for Architect's review. Architect will advise colors required or furnish samples for color matching.
- E. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- F. Provide field samples of finishes at Project, at location acceptable to Architect and Owner's Construction Manager, as required by individual Specifications section and in accordance with Section 01450. Install each sample complete and finished.
- G. Approved samples that may be used in the Work are indicated in individual specification Sections.

1.10 INFORMATIONAL SUBMITTALS

- A. Informational submittals upon which Architect is not expected to take responsive action may be so identified in Contract Documents. When professional certification of performance criteria of materials, systems, or equipment is required by Contract Documents, Architect shall be entitled to rely upon accuracy and completeness of such certifications.
- B. Types of Informational Submittals:
 - 1. Design data: Submit with shop drawings.
 - 2. Test reports: Submit within 2 weeks of testing.
 - 3. Certifications:
 - a. Submit certifications when specified in individual Specification sections.
 - b. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - c. Certifications may be recent or previous test results on material or product, but must be acceptable to Architect.

- d. Submit welder certifications 2 weeks prior to commencement of welding operations.
 - e. Submit manufacturer or fabricator certifications with product data.
 - f. Submit certificates of compliance within 2 weeks following approval or acceptance by authority having jurisdiction.
 - g. Submit installation certifications within 2 weeks following completion of product installation.
4. Engineering Certifications:
- a. Submit certified statement, signed and sealed by professional engineer responsible for design attesting to the following:
 - 1) Conformity to applicable governing codes.
 - 2) Conformity to criteria in Contract Documents.
 - 3) Component parts were designed or selected for locale and application intended.
 - b. Submit with shop drawings. Submit prior to fabrication if shop drawings are not required by individual specification sections.
5. Qualification Data:
- a. When specified in individual Sections, submit manufacturer's, fabricator's, and installer's qualifications verifying years of experience.
 - b. Include list of completed projects having similar scope of Work identified by name, location, date, reference names, and phone numbers.
 - c. Submit manufacturer qualification data with proposed products list.
 - d. Submit fabricator or installer qualification data with list of subcontractors at least 15 days prior to submitting first Application for Payment.
6. Manufacturer's Instructions:
- a. Refer to Section 01450 for requirements.
 - b. When specified in individual Specification sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, adjusting, finishing, and other pertinent data.
 - c. Identify conflicts between manufacturer's instructions and Contract Documents.
 - d. Submit with product data.
7. Manufacturer's Certificates:
- a. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.
 - b. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
 - c. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.
8. Manufacturer's Field Reports:
- a. Refer to Section 01450 for requirements.
 - b. When specified in individual Specification sections, submit written results and findings of manufacturer's field services specified as part of Field Quality Control.
 - c. Submit within 2 weeks following completion of field services covered in individual reports.
- C. Quantity: Submit in quantities specified for product data.

1.11 INCOMPLETE AND PARTIAL SUBMITTALS

- A. Incomplete Submittal: Submittal not complying with specified submittal requirements.
- B. Partial Submittal: Submittal subdivided into components as indicated in submittal schedule and each component submitted separately.
- C. Architect will not review incomplete submittals. Complete submittals for each item are required. Submittal will not be considered official until it is complete in every respect. Delays resulting from incomplete submittals are not responsibility of Architect.

1.12 PROGRESS SCHEDULES

- A. Refer to Section 01320.

1.13 CONSTRUCTION PHOTOGRAPHS

- A. Refer to Section 01320.

1.14 QUALITY CONTROL AND CONTRACT CLOSEOUT SUBMITTALS:

- A. Submit quality control and contract closeout information as indicated in respective specification sections.
 - 1. Design data or calculations requiring professional certification shall be properly sealed and signed by a registered professional engineer licensed in State where project is located.
 - 2. Test reports shall be in accordance Section 01450.
 - 3. Installation instructions submitted in accordance with Section 01600.
 - 4. Contract closeout submittals in accordance with Section 01780.
 - 5. Submit 4 copies of Quality Control submittals concurrent with Shop Drawing and Product Data submittals.
 - 6. Submit number of Contract Closeout submittals as specified in Section 01780.
- B. Submit in same manner as Product Data, except as otherwise specified.

1.15 CONTRACTOR REVIEW

- A. Review submittal prior to transmittal; determine and verify field measurements, field construction criteria, quantities and details, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
- B. Coordinate submittal with requirements of Work and of Contract Documents.
- C. Sign or initial in a rubber-stamped review block format, each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Architect in writing at time of submittal of any deviations from requirements of Contract Documents.
- D. Do not fabricate products or begin work that requires submittal until return of submittal with Architect's acceptance.
- E. Responsibility for errors and omissions in submittal is not relieved by Architect's review of submittal.
- F. Responsibility for deviations in submittal from requirements of Contract Documents is not relieved by Architect's review of submittal, unless Architect gives specific written acceptance of deviations. Architect will review submittal for general conformance to design intent only.

1.16 ARCHITECT AND ENGINEER REVIEW

- A. Architect will review construction progress schedules, and submittal schedules. Architect will review product lists, shop drawings, product data, and samples and return within 10 working days of receipt for submittals made within the first weeks after the start of construction. Submittals arriving after the first 4 weeks will be reviewed within 20 working days of receipt.
- B. Do not make "Mass" submittals (6 or more submittals) to Architect at one time. If Mass submittals are received, Architect's review time stated above will be extended as necessary to perform proper review. Architect will review Mass submittals based upon priority determined by Architect after consultation with Contractor.
- C. Informational submittals and other similar data are for Architect's information and do not require Architect's responsive action.
- D. Architect's review of submittals is for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Architect's review is not conducted for purpose of determining accuracy and completeness of items such as dimensions and quantities, that remain responsibility of Contractor.
- E. Architect's review and approval of submittals does not relieve Contractor of responsibility for deviations from Contract Document requirements, unless Architect is informed in writing of deviations and approval is received in writing from Architect for such deviation.

- F. Architect's review and acceptance of submittals does not indicate acceptance of changes in Contract time or cost.
- G. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- H. Submittals stamped "No Exception Taken": No corrections or resubmittal required; fabrication may proceed.
- I. Submittals stamped "Make Corrections Noted": Comply with noted corrections and modifications; and resubmit. Fabrication may proceed. If for any reason noted corrections and modifications can not be fully complied with, resubmit for review requesting clarification; do not proceed with fabrication.
- J. Submittals stamped "Rejected" or "Revise/Resubmit": Revise and resubmit for review; do not proceed with fabrication. Clearly indicate revisions, including corrections, to previous submittal. Disapproved submittals will not be considered valid cause for construction delay.
- K. Submittal approval does not authorize changes to Contract requirements unless accompanied by a Change Order, Architect's Supplemental Instruction, or Construction Change Directive.
- L. Architect will transmit 3 copies of Approved or Approved as Noted submittals to Owner.

1.17 RE-SUBMITTALS

- A. Make re-submittal under procedures specified for initial submittals; identify changes made since previous submittal.

1.18 DISTRIBUTION

- A. Duplicate and distribute reproductions of shop drawings, copies of product data, and samples, that bear Architect stamp of approval, to job site file, Record Documents file, subcontractors, suppliers, and other entities requiring information.

1.19 SCHEDULE OF SUBMITTALS

- A. Incorporate schedule of submittals into pre-construction meeting distribution. See attached form for use.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 SCHEDULE

- A. Landscape Irrigation: Submit installation drawings.
- B. Sitework:
 - 1. Concrete mix for paving and walks.
 - 2. Mix design and testing reports.
- C. Concrete:
 - 1. Concrete Mix: Submit design and test reports.
 - 2. Shop drawings for reinforcing steel.
- D. Masonry:
 - 1. Submit samples of brick.
 - 2. Submit samples of thin brick.
- E. Structural and Miscellaneous Steel:
 - 1. Shop drawings for structural and miscellaneous steel.
- F. Wood and Plastics:
 - 1. Shop drawings for millwork.
 - 2. Samples for prefinished panels.
 - 3. Wood finishes.
- G. Thermal and Moisture Protection:
 - 1. Roofing system including manufacturer's warranty.

2. Flashing and sheet metal including manufacturer's warranty.
 3. Product literature and drawings for roof hatch.
- H. Doors and Windows:
1. Shop drawings for metal doors.
 2. Shop drawings for wood doors and windows.
 3. Hardware: Submit literature and schedule.
- I. Finishes:
1. Samples of plastic laminate and solid surfacing.
 2. Sample panels of tiles including exhibition of patterns if applicable.
 3. Samples of paint colors (draw downs).
 4. Samples of toilet partition materials.
 5. Samples of ceiling tile and grid.
- J. Samples and shop drawings of awning.
- K. Fire Protection and Hydraulic Calculations: Submit shop drawings and calculations.
- L. HVAC Equipment and Ductwork: Submit literature and shop drawings.
1. Submit HVAC test and balance reports.
- M. Plumbing Fixtures including Water Heater: Manufacturer's literature.
- N. Electrical:
1. Switchgear, Panels, Circuit Breakers: Submit shop drawings and manufacturer's literature.
 2. Cabinets: Submit shop drawings.
 3. Switches and Receptacles: Submit manufacturer's literature.
 4. Fire Alarm and Security System: Submit shop drawings and manufacturer's literature.
 5. Sound System: Submit manufacturer's literature.
 6. Light Fixtures: Submit manufacturer's literature.

END OF SECTION

SECTION 01420

REFERENCES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- 2. Section Includes:
 - 1. Reference standards.
 - 2. Explanation of project manual content.
 - 3. Abbreviations and symbols.
 - 4. Definitions.
 - 5. Metric measurements.

1.2 REFERENCE STANDARDS

- A. Comply with association, trade, federal, commercial, standards generating organization (such as ANSI and ASTM), and other similar standards referenced within Specification sections, except where more explicit or stringent requirements are indicated or required by Specification or applicable codes.
- B. Reference standards include their associated amendments and supplements.
- C. Except where a specific date is indicated, date of standard is latest edition in effect at date of Contract Documents, or date of standard required by code.
- D. Reference standards have same force and effect as if bound into or copied directly into Contract Documents; standards are made a part of Contract Documents by reference.
- E. Contractual relationship of parties to the Contract shall not be altered from Contract Documents by mention or inference otherwise in reference standards.
- F. Names and titles of standards are frequently abbreviated. Where acronyms or abbreviations are used in Specifications, they are defined to mean the recognized name of trade association, standards generating organization, governing authority, or other entity applicable to context of text provision.
- G. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- H. When indicated by individual Specification section, obtain copy of standard. Maintain copy at Project site during submittals, planning, and progress of specific work, until Substantial Completion.
- I. Units of measurements required by specifications govern regardless of units of measurement used in reference standards.

1.3 EXPLANATION OF PROJECT MANUAL CONTENT

- A. Section Numbering and Titles: Sections are placed in Project Manual in numeric sequence; refer to Table of Contents at beginning of Project Manual for complete listing of sections and titles.
- B. Page Numbering: Pages are numbered sequentially within each section. Page number is shown together with section number at bottom of each page.
- C. Project Identification: Project name, Owner's project number and date of Contract Documents are recorded at bottom of each page to minimize possible misuse or confusion with other project specifications.
- D. Specifying Methods: Techniques or methods of specifying varies throughout text and may include "prescriptive," "generic-descriptive," "compliance with standards," "performance," "proprietary," or a combination of these.

- E. Language:
 1. Imperative mood of sentence structure is generally used which places verb as first word in sentence. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor.
 2. In certain circumstances, the language of specifications and other contract documents are of abbreviated type. It implies words and meanings that will be appropriately interpreted. Words such as "the," "shall," "shall be," "Contractor shall," "a," "all," "an," "any," and other similar words are eliminated.
 3. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of Contract Documents so indicates.
 4. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.
- F. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
- G. Specialist Assignments:
 1. In certain circumstances, Specification text requires or implies that specific elements of Work are to be assigned to specialists who must be engaged to perform that element of Work. Such assignments are special requirements of Contract.
 2. Such assignments are intended to establish which party or entity involved in a specific element of Work is considered as being sufficiently experienced in indicated construction processes or operations to be recognized as "expert" in those processes or operations. Nevertheless, ultimate responsibility for fulfilling Contract requirements remains with Contractor.
 3. These requirements should not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- H. Minimum Quality and Quantity: In every instance, quality level or quantity shown or specified is intended to be minimum for Work to be performed or provided. Except as otherwise specifically indicated, actual Work may either comply exactly with that minimum within specified tolerances, or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision before proceeding.

1.4 ABBREVIATIONS

- A. Explanation of metric abbreviations is located in ASTM E 380 Practice for Use of the International System of Units (SI).

1.5 SYMBOLS

- A. List of Symbols:
 - # Number.
 - % Percent.
 - EF Degrees Fahrenheit.
 - EC Degrees Celsius.
 - ' Feet.
 - " Inches.
 - +/- Plus to Minus; Plus or Minus.

1.6 DEFINITIONS

- A. And: Conjunction indicating that items in a series are to be taken jointly. It may also mean plus or in addition to the preceding items in the series.

- B. Approved: Where used in conjunction with Architect response or action, the meaning will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will Architect's approval be interpreted as release of Contractor from responsibilities to fulfill requirements of Contract Documents.
- C. Custom Color: Refers to color selection by Architect that is not limited to a manufacturer's standard color or a manufacturer's color that is designated by the manufacturer as "custom", "premium" or any other designation. Custom color means any color selected by Architect.
- D. Directed, Requested: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect," "requested by Architect," and similar phrases. However, no such implied meaning shall be interpreted to extend Architect's responsibility into area of construction supervision.
- E. Finish: The manner or method of completion. The final appearance of a surface, including texture, smoothness, sheen, and color, after finishing operations have been performed. Finishing operations include preparation of substrate and application, curing, and protection of specified finish materials.
- F. Furnish: Means to supply, purchase, procure and deliver complete with related accessories, ready for assembly, application, installation, and similar operations, as applicable in each instance.
- G. Indicated: Refers to graphic representations, notes, or schedules on Drawings, or other paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help reader locate the reference. Location is not limited.
- H. Install: Means to construct, assemble, erect, mount, anchor, place, connect, apply and similar operations, complete with related accessories, as applicable in each instance, connected, operable, and ready for service or intended use.
- I. Installer: Entity (person or firm) engaged to perform a particular unit of Work at Project site, including installation, erection, application, repair, patching, and similar required operations. Such entities must be experienced in operations they are engaged to perform.
- J. Or: Used to introduce any of the possibilities in a series. Items in the series are not required to be taken jointly. It does not mean that individual items in the series are optional requirements.
- K. Product: Includes natural and manufactured materials, components, machinery, fixtures, equipment, devices, furnishings, systems, and their associated accessories to be incorporated into the Work.
- L. Provide: Means to furnish and install, complete and ready for operations and use for purpose intended.
- M. Regulations: Includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within construction industry that control performance of the Work.
- N. Similar: Interpreted in its general sense and not as meaning identical. Elements defined as "similar" shall be coordinated in relationship to their location and connection with other parts of the Work.
- O. True To Line, Plumb, Level, and Flat: Install Work within following tolerances, except where indicated otherwise:
 1. True to line: Allowed deviation from straight line within plus or minus 1/16 inch in 1 foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 3/8 inch in lengths over 20 feet.
 2. Level: Allowed deviation from horizontal plane within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 1/2 inch in lengths over 20 feet.
 3. Plumb: Allowed deviation from vertical plane within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 1/2 inch in lengths over 20 feet.
 4. Flat: Allowed deviation from flat plane in any planar direction within plus or minus 1/16 inch in 1 foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 3/8 inch in lengths over 20 feet.
 5. Tolerances are not accumulative.

PART 2 PRODUCTS and PART 3 EXECUTION
Not Used

END OF SECTION

SECTION 01450
QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Quality control of products and workmanship.
 - 2. Manufacturer's instructions.
 - 3. Manufacturer's certificates and field services.
 - 4. Mockups.
 - 5. Field samples.
 - 6. Owner provided testing laboratory services.
 - 7. Selection and payment.
 - 8. Laboratory responsibilities.
 - 9. Laboratory reports.
 - 10. Limits on testing laboratory authority.
 - 11. Contractor responsibilities.
 - 12. Schedule of inspections and tests.

1.2 DESCRIPTION

- A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, and site conditions, to produce Work in accordance with Contract Documents.

1.3 DEFINITIONS

- A. Field Samples: Partial installation of selected materials installed at Project site for Architect's or Owner's Construction Manager's review and approval of visual features and workmanship.
- B. Mock-ups: Full size assemblies that incorporate several materials or elements of construction erected for Architect's and Owner's Construction Manager's review and approval of visual features and workmanship. Mock-ups represent quality of materials and workmanship required for Work.

1.4 PERFORMANCE REQUIREMENTS

- A. Workmanship:
 - 1. Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
 - 2. Provide suitably qualified personnel to produce Work of specified quality.
 - 3. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.
 - 4. Provide finishes to match approved samples.
- B. Manufacturer's Instructions:
 - 1. Require compliance with instructions in full detail, including each step in sequence. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents.
 - 2. Maintain one complete set of instructions at Project Site during installation and until completion.
 - 3. Should instruction conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Manufacturer's Certificates:

1. When required in individual Specifications section, submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer.
- D. Manufacturer's Field Services and Reports:
 1. Submit reports in accordance in accordance with Section 01330.
 2. Submit qualifications of field observer 30 days in advance of required observations; observer is subject to approval of Architect and Owner's Construction Manager.
 3. When specified in individual Specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces, quality of workmanship, and conditions of installation as applicable, and to initiate instructions when necessary.
 4. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
 5. Submit reports within 7 days of observation. Distribute copies to Architect and Owner's Construction Manager, Project site file, subcontractor, and other entities requiring information.
 6. Provide one additional copy of reports for record documents file; refer to Section 01780.

1.5 QUALITY ASSURANCE

- A. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- B. Ensure that persons performing Work are qualified to produce workmanship of specified quality.
- C. Monitor quality control over products, suppliers, manufacturers, services, site conditions, and workmanship to ensure Work complies with Contract Documents.
- D. Comply with specified reference standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.6 EXAMINATION OF CONDITIONS

- A. Examine substrates and conditions under which Work is to be performed. Do not commence work over unsatisfactory conditions detrimental to proper and timely execution of Work.
- B. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. Commencement of installation constitutes acceptance of conditions and cost of any corrective measures are responsibility of Contractor.

1.7 FIELD SAMPLES

- A. General:
 1. Provide field samples at site required by individual Specification sections.
 2. Erect at location acceptable to Owner's Construction Manager; perform Work in accordance with applicable Specification sections.
 3. Construct complete, including Work of related trades required in finished Work.
 4. Make adjustments necessary to obtain approval from Architect and Owner's Construction Manager. Do not proceed with further work until sample installation has been approved by Architect and Owner's Construction Manager.
 5. Approved samples will serve as standard of quality and workmanship of Work; maintain samples until completion of relevant Work.
 6. Upon completion of Work or when directed by Owner's Construction Manager, demolish field samples and remove from site, unless accepted by Owner's Construction Manager as part of completed Work.

1.8 TESTING LABORATORY SERVICES

- A. General:
1. Where terms "Laboratory", "Inspector", "Inspection Laboratory", "Laboratory" or "Testing Laboratory" are used, they mean and refer to officially designated and accredited testing laboratory.
 2. Provide testing laboratory with one set of Contract Documents and relevant approved submittals.
- B. Selection and Payment:
1. Owner will employ services of an independent testing laboratory to perform specified inspection and testing.
 2. Employment of testing laboratory in no way relieves obligation to perform Work in accordance with requirements of Contract Documents. Contractor will pay testing required by local authorities having jurisdiction.
- C. Laboratory:
1. Cooperate with Architect, Owner's Construction Manager, and Contractor.
 2. Comply with requirements of ANSI/ASTM E 329 and ANSI/ASTM D 3740.
 3. Maintain a full-time registered Engineer on staff to review services.
 4. Authorized to operate in State where project is located.
 5. Provide evidence of insurance against errors and omissions by a professional liability insurance policy having a limit of liability not less than \$500,000.00.
 6. Calibrate testing equipment once each year with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.
 7. Test samples of mixes submitted by Contractor.
 8. Provide qualified personnel at site. Cooperate with Contractor, Architect, and Owner's Construction Manager in performance of services.
 - a. Personnel Monitoring Concrete Work: ACI certified inspectors.
 - b. Primary Structural Steel Inspectors: AWS Certified Welding Inspectors (CWI) in accordance with provisions of AWS QCI.
 - c. Associate Structural Steel Inspectors: AWS Certified Associate Welding Inspectors (CAWI) working under the supervision of a Primary Inspector.
 9. Perform specified inspection, sampling, and testing of products in accordance with specified standards and technical sections of these Specifications.
 10. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 11. Promptly notify Owner's Construction Manager and Contractor of observed irregularities or non-conformance of Work or products.
 12. Coordinate material testing and inspection requirements with Contractor consistent with the construction schedule.
 13. Perform additional inspections and tests required by Owner's Construction Manager.
 14. Attend Pre-construction Conference.
 15. Attend other conferences as required or requested to address quality control issues.
- D. Laboratory Reports:
1. After each inspection and test, promptly submit copies of laboratory report directly to Owner's Construction Manager, applicable consultant, and Contractor.
 2. Include: Date issued, project title and number, name of inspector, date and time of sampling or inspection, identification of product and Specifications section, location in the Project, type of inspection or test, date of test, results of tests, and conformance with Contract Documents.
 3. When requested by Owner's Construction Manager, provide interpretation of test results.
- E. Limits on Testing Laboratory Authority:
1. May not release, revoke, relax, alter, or enlarge on requirements of Contract Documents.
 2. May not approve or accept any portion of the Work.
 3. May not assume any duties of Contractor.
 4. Has no authority to stop Work.

1.9 CONTRACTOR RESPONSIBILITIES

- A. Deliver to laboratory at designated location adequate samples of materials proposed to be used that require testing, together with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to Work and to manufacturer's facilities.
- C. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- D. Notify laboratory of material sources and furnish necessary quantities of representative samples of materials proposed for use which are required to be tested.
- E. Notify Owner's Construction Manager and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
- F. Advise laboratory in a timely fashion to complete required inspection and testing prior to subsequent work being performed.
- G. Pay for subsequent re-testing of products or systems found to be defective or otherwise not in accordance with specification requirements. Remove rejected products and replace with products of specified quality.
- H. Furnish copies of product tests or mill test reports as specified or required.
- I. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at Project site or at source of product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- J. Notify Owner's Construction Manager and laboratory 48 hours prior to expected time for operations requiring inspection and testing services.
- K. When inspections or tests can not be performed after proper notification and at no fault of laboratory, reimbursement costs for laboratory expenses incurred will be charged to Contractor by deducting charges from Contract Sum.

1.10 SUBMITTALS

- A. Provide submittals in accordance with Section 01330.
- B. Laboratory Reports:
 - 1. Include with each report:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name, address, and telephone number.
 - d. Record of temperature and weather conditions.
 - e. Names of individuals making tests and inspections. Name and signature of person submitting report.
 - f. Dates, times, and locations of sampling, testing, and inspection.
 - g. Identification of specification section and products.
 - h. Location in Project.
 - i. Type of inspection or test.
 - j. Reference standards used for test.
 - k. Name of material suppliers.
 - l. Results of tests and interpretation of test results.
 - m. Professional opinion of whether tested and inspected Work complies with Contract Documents.
 - n. Certified statement, signed and sealed by testing laboratory attesting to accuracy of testing results.
 - o. Number pages.
 - 2. Submit test reports within 2 weeks of test date.
 - 3. After each inspection and test, promptly submit copies of written reports as follows:
 - a. Owner: 1 copy.
 - b. Owner's Construction Manager: 1 copy.
 - c. Architect: 1 copy.

- d. Applicable Consultant: 1 copy.
 - e. Code Officials: 1 copy.
 - f. Contractor: 2 copies.
4. When requested by Owner's Construction Manager, provide interpretation of test results and suggested remedies.

1.11 FAILURES AND RETESTING

- A. When initial inspections and tests indicate Work does not comply with Contract Documents, subsequent testing will be performed by same Testing Agency and will be done at Contractor's expense and deducted from Contract Sum.
- B. Removal and replacement of Work necessitated by such non-compliance of Contract Documents shall be at Contractor's expense.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 FOOTING EXCAVATIONS:

- A. A representative of the owner's geotechnical consultant shall inspect each concrete footing excavation to determine that proper bearing stratum is obtained and utilized for bearing and that excavations are properly clean and dry before concrete is placed.
- B. Observe, on a full time basis, drilling of probe holes for footings. Immediately advise Owner and Contractor of any necessary adjustments to footings as a result of poor rock conditions or voids.

3.2 BUILDING PAD:

- A. Owner's testing laboratory shall perform testing and inspection specified herein.
- B. Contractor shall make available to laboratory, free of charge, adequate samples of each fill and backfill material from proposed sources of supply.
- C. A 50 pound sample of each type of off-site and site-excavated material proposed for use shall be given to Testing Agency by Contractor not less than 10 calendar days prior to start of specified work. Analyze samples as required to provide a soil description and to determine compliance with gradation and quality requirements, and test as follows:
 - 1. Tests for liquid limit of soils in accordance with ASTM D 423.
 - 2. Tests for plastic limit of soils and plasticity index of soils in accordance with ASTM D 424.
 - 3. Tests for moisture/density relations of soil in accordance with ASTM D 698 or D 1557, as applicable.
- D. Furnish a report for each individual test, describing variances from specified requirements and state whether material is acceptable for intended use.
- E. Inspect excavated subgrade and identify to Contractor any remaining unsuitable material that must be removed, and any soft areas that must be recompacted.
- F. Inspect and test prepared subgrade after initial rolling and compaction of scarified surface, before the placement of any fill.
- G. Make in-place compaction test for moisture content and density relations, and density of materials-in-place to determine that backfill and fill materials have been compacted to specified density. Make tests at the following frequencies:
 - 1. A minimum of 3 tests will be required of each lift.
- H. Reports may be combined on a daily basis, if desired, provided that location of each test and applicable lift are clearly identified and any problems are detailed.

3.3 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES:

- A. Inspect concrete reinforcing steel prior to placing of concrete for compliance with Contract Documents and approved shop drawings. Instances of noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of the Contractor for correction and then, if uncorrected, reported to Owner's Construction Manager.
- B. Observe and Report on the Following:
 - 1. Number and size of bars.
 - 2. Bending and lengths of bars.
 - 3. Splicing.
 - 4. Clearance to forms including chair heights.
 - 5. Clearance to sides and bottom of trench if soil-formed.
 - 6. Clearance between bars or spacing.
 - 7. Rust, form oil, and other contamination.
 - 8. Grade of steel.
 - 9. Securing, tying, and chairing of bars.
 - 10. Excessive congestion of reinforcing steel.
 - 11. Installation of anchor bolts and placement of concrete around such bolts.
 - 12. Fabrication and installation of embedded metal assemblies, including visual inspection of welds.
- C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

3.4 CONCRETE INSPECTION AND TESTING:

- A. Receive and evaluate proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Owner's Construction Manager certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as unacceptable.
- B. Secure composite samples of concrete at the jobsite in accordance with ASTM C 172.
- C. Mold and cure four specimens from each sample in accordance with ASTM C 31. Supervise curing and protection provided (by others) for test specimens in field, and transportation from the field to laboratory. Test cylinders shall be stored in the field 24 hours and then be carefully transported to laboratory and cured in accordance with ASTM C 31.
- D. Test specimens in accordance with ASTM C 39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at seven days for information. Hold one cylinder in reserve for use as required.
- E. Make one strength test (four cylinders) for each 100 cubic yards or fraction thereof, of each mix design of concrete placed in any one day.
- F. Make one slump test for each set of cylinders following procedural requirements of ASTM C 143 and C 172. Make additional slump tests whenever consistency of concrete appears to vary. Do not permit placement of concrete having a measured slump outside limits given on Drawings. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.
- G. Determine total air content of air entrained normal-weight concrete sample for each strength test in accordance with ASTM C 231.
- H. Determine temperature of concrete sample for each strength test.
- I. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to the Owner's Construction Manager, Contractor and concrete supplier. Do not permit addition of water which will exceed maximum water/cement ratio for the mix as given on the approved mix design.
- J. Observe placing of concrete, except non-structural slabs-on-grade and sitework. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when procedures have been deemed satisfactory by the laboratory.

- K. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or poured), amount of water added and time at which cement and aggregate was dispensed into the truck, and time at which concrete was discharged from the truck.
- L. Evaluation and Acceptance:
 - 1. If measured slump, or air content of air entrained concrete, falls outside specified limits a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the specifications, and shall not be used in the structure.
 - 2. Strength level of concrete will be considered satisfactory if the averages of sets of three consecutive strength test results are equal to, or exceed, specified strength and no individual test result (average of two cylinders) is below specified strength by more than 500 psi.
 - 3. Completed concrete work will be accepted when requirements of "Specifications for Structural Concrete for Buildings," ACI 301, Chapter 18, have been met.
- M. Concrete Test Reports:
 - 1. Reports shall be made and distributed immediately after respective tests or inspections are made.
 - 2. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and, where applicable, a recommendation for corrective action.
- N. Comply with ACI 311, "Guide For Concrete Inspection" and "ACI Manual of Concrete Inspection" (SP-2).
- O. Inspect application of curing compound and monitor curing conditions to assure compliance with specification requirements. Report curing deficiencies to the Contractor immediately and submit a written report to the Owner's Construction Manager.

3.5 TESTING NON-SHRINK GROUT:

- A. Make one strength test for every 10 base plates grouted and for every 10 bags of grout used in joints between members.
- B. Each test shall consist of four cubes, two to be tested at 7 days and two at 28 days, made and tested in accordance with ASTM C 109, with the exception that grout shall be restrained from expansion by a top plate.

3.6 STRUCTURAL STEEL:

- A. Inspect structural steel during fabrication and during and after erection for conformance with Contract Documents and shop drawings. Review and report on fabricator's quality control procedures and capabilities.
- B. Field Inspection:
 - 1. Proper erection of pieces.
 - 2. Proper touch up painting of structural steel exposed in the crawl space.
 - 3. Proper installation of bolts.
 - 4. Plumbness of structure and proper bracing.
 - 5. Proper field painting.
 - 6. Initial inspection of welding process and periodically thereafter as necessary.
 - 7. Visual examination of completed welds.
 - 8. Ultrasonic testing of penetration field welds.
 - 9. Inspect shop-fabricated members, upon their arrival at the jobsite, for defects incurred during transit and handling.
 - 10. Measure and record camber of beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Members outside specified camber tolerance shall be returned to shop for correction.
- C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders to be employed on work, along with certification that each welder has passed qualification tests within the last year, using procedures covered in American Welding Society "Structural Welding Code - Steel," D1.1, latest edition. Verify welder qualifications.

- D. Shop Inspection:
 - 1. Ultrasonic testing of full penetration welds.
- E. Inspection of field welding shall include the following:
 - 1. Visually inspect fillet welds for size, soundness, and proper return around ends. Check for seams, folds, and delaminations.
 - 2. Ultrasonically test penetration welds in accordance with ASTM E 164.
 - 3. Inspect surfaces to be welded. Surface preparations, fit-up and cleanliness of surface shall be noted. Electrodes shall be checked for size, type and condition.
 - 4. Welding inspector shall be present during alignment and fit-up of members being welded, and shall check for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and rewelded. Root passes shall be thoroughly inspected for cracks. Cracks shall be gouged out and rewelded to 2 inches beyond each end of crack.
 - 5. Inspector shall check that welds have been marked with welder's symbol and shall mark welds requiring repairs and shall make a reinspection. Inspector shall maintain a written record of welds. Work completed and inspected shall receive an identification mark by the inspector. Unacceptable material and work shall be identified by word "reject" or "repair" marked directly on the material.
 - 6. Testing agency shall advise the Owner and Owner's Construction Manager of any shop and/or field conditions which, in his opinion, may require further tests and examination by means other than those specified. Such further tests and examinations shall be performed as authorized by the Owner and Owner's Construction Manager.
 - 7. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
- F. Inspection of bolted construction shall be in accordance with AISC Specification for Structural Steel Buildings and as follows:
 - 1. All bolts shall be visually inspected to ensure that plies have been brought into snug contact.
 - 2. High strength bolting shall be inspected in accordance with Section 9 of the "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts."

3.7 PREFABRICATED WOOD JOIST

- A. Inspect joists either in plant or at job site for conformance with specified fabrication requirements. Check nail plates, bolted connections, and straightness of members.
- B. Measure and record camber of wood joists upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Return to shop for correction members outside specified camber tolerance.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Electricity, lighting.
 - 2. Heat, ventilation.
 - 3. Telephone service.
 - 4. Water.
 - 5. Sanitary facilities.
 - 6. Fire protection.
 - 7. Barriers.
 - 8. Enclosures.
 - 9. Protection of installed work.
 - 10. Security.
 - 11. Water control.
 - 12. Field offices and sheds.
 - 13. Access roads and temporary parking.

1.2 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from Utility source.
- B. Provide temporary electric feeder from utility source to electrical service at location as directed.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- D. Permanent convenience receptacles may be utilized during construction.
- E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
- F. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 2,500 sq. ft. of active work area.
- G. Provide 20 ampere, single phase branch circuits for lighting.

1.3 TEMPORARY LIGHTING

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq. ft.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may be utilized during construction.
- F. Provide a minimum of 80 f.c. of lighting on surfaces to receive finished materials.

1.4 TEMPORARY HEAT

- A. Provide and pay for heat devices and heat as required to maintain specified conditions for construction operations.
 - 1. Provide smokeless portable space heaters of type approved by Underwriters' Laboratories, Inc. and governing authority, properly vented.

- B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
 - 1. Operate the system under the supervision of the Subcontractor responsible for its installation and ultimate performance, assume full responsibility for the entire heating system and pay costs for operation, maintenance and restoration of the system.
 - C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- 1.5 TEMPORARY VENTILATION
- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
 - B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.
 - 1. Operate the system under the supervision of the Subcontractor responsible for its installation and ultimate performance, assume full responsibility for the entire ventilation system and pay costs for operation, maintenance and restoration of the system.
 - 2. Provide temporary filters of an approved type within the fan enclosures to adequately filter air being distributed through the ductwork to the supply outlets; replace disposable filters in front of exhaust registers to keep construction dirt out of exhaust ductwork.
- 1.6 TEMPORARY TELEPHONE SERVICE
- A. Provide telephone service to field office.
 - B. Provide a minimum of 3 separate lines.
 - 1. One line for Contractor's use and equipment.
 - a. One portable hand-held telephone device for Job Superintendent's use around project site.
 - 2. One line for facsimile for use between Owner's corporate office and job site.
 - a. Provide facsimile machine with telephone.
 - 3. One data line and email address for use by Job Superintendent.
- 1.7 TEMPORARY WATER SERVICE
- A. Provide service required for construction operations. Extend branch piping with outlets located so that water is available by use of hoses.
 - B. Ensure water is potable and approved for drinking.
- 1.8 TEMPORARY SANITARY FACILITIES
- A. Provide and maintain required facilities and enclosures.
 - B. Provide number and type in accordance with labor work rules, governing codes, and health requirements.
- 1.9 TEMPORARY FIRE PROTECTION
- A. Observe and enforce throughout the work requirements of City, State and Insurance authorities to minimize fire hazards.
 - B. Prohibit lighting of fires.
 - C. Restrict smoking to designated areas.
 - D. Remove combustible refuse from within each building daily.
 - E. Provide fire extinguishers as required by the local fire department and city ordinances.

1.10 BARRIERS

- A. Provide as required to prevent public entry to construction areas [to provide for Owner's use of site,] and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide 6 foot high commercial grade chain link fence around construction site; equip with vehicular and pedestrian on outside gates with locks.
- C. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.
- D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water. Protect from staining on trunk and branches. Do not disturb existing soil at base or within drip line in any manner.

1.11 ENCLOSURES

- A. Provide temporary weather-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.
 - 1. Maintain minimum temperature of 45 degrees F.
- B. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to prevent damage to existing areas and equipment. Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; Flame Spread Rating of 25 in accordance with ASTM E 84; paint surfaces exposed to view in Owner occupied areas.

1.12 PROTECTION OF INSTALLED WORK

- A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- B. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.
- C. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.

1.13 SECURITY

- A. Coordinate with Owner's security program.
- B. Guard Service: Owner may provide a guard service during the last weeks of construction. If this service is provided, Contractor duties are as follows:
 - 1. Ensure the guard on duty signs in and out with the Project Superintendent. If this is not possible for any reason, advise TGI Friday's of the alternate arrangements that are made with the Guard Service.
 - 2. Lock doors to building with exception of door the guard will use and that must remain unlocked for him.
 - 3. Inform guard of anyone authorized to work at the job site during security hours, such as, certain trades, cleaning crew.
 - 4. Provide a local telephone number for the project superintendent to be used in case of an emergency. List Contractor as first contact.
 - 5. Provide a home telephone number to be used in case the superintendent cannot be reached.
 - 6. Refer to further requirements included on Security Work Order.
 - 7. Use Security Work Order and Visitor Sign-In Sheet, TGIF form.

1.14 PARKING

- A. Provide temporary gravel surface parking areas to accommodate construction personnel.
- B. When site space is not adequate, provide additional off- site parking.

- C. Designate one parking space for the Owner's Representative.
- 1.15 WATER CONTROL
- A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment.
 - B. Protect site from ponding or running water.
- 1.16 FIELD OFFICES AND SHEDS
- A. Office:
 - 1. Weather-tight, with lighting, electrical outlets, telephone, heating, and air conditioning equipment.
 - 2. Equip with minimum of one layout table, one desk, file cabinet, plan rack and 2 chairs.
 - 3. In addition, provide space for Project meetings, with table and chairs to accommodate 10 persons.
 - B. Internet Access:
 - 1. Provide high-speed Internet access for use by Contractor.
 - a. Provide for electronic mail sending and receiving.
 - b. Provide for transmittal of electronic media including digital photographs.
 - C. Digital Camera: Provide one digital camera for Job Superintendent's use.
 - D. Office for Owner's Construction Manager:
 - 1. Provide within the field office.
 - 2. Minimum Floor Area: 84 square feet.
 - 3. Secure walled-in space, electric lights, heat and cooling, door with secure lock.
 - 4. Layout Table: Minimum 2'-6" by 5'-0".
 - 5. Plan holder for working drawings.
 - E. Storage Sheds for Tools, Materials, and Equipment:
 - 1. Weather-tight, with heat and ventilation for Products requiring controlled conditions, with adequate space for organized storage and access, and lighting for inspection of stored materials.
- 1.17 TEMPORARY STORAGE FOR OWNER-FURNISHED PRODUCTS
- A. Provide adequate, suitable, secure and watertight temporary storage facilities, outside of the building structure, for "Owner Furnished" items. Provide temporary storage facilities for the exclusive storage of "Owner Furnished" items only.
 - 1. Provide for a minimum time period beginning no less than 30 days after the start of construction and continuing through and including substantial completion of the Project.
 - 2. Provide a minimum of two 40 feet long by 8 feet wide transport dock height trailers. Obtain prior written approval from the Owner for permission to locate temporary storage facilities on-site prior to the delivery and be responsible for on-site location approvals and the acquisition of parking permits, permit fees and transit fees.
 - B. The Contractor shall not be allowed to use the coolers or freezers for temporary storage during construction.
- 1.18 EMERGENCY TELEPHONE NUMBERS
- A. Post on construction trailer door emergency numbers for the Job Superintendent and Contractor's company office.
 - B. Handwritten signs are not allowed.
 - C. Provide weather-resistant materials and lettering.
- 1.19 CLEANING DURING CONSTRUCTION
- A. Refer to Section 01740.
 - B. Conduct cleaning and disposal operations to comply with Federal, State, and local anti-pollution laws.
 - C. Do not burn or bury rubbish or waste materials on project site. Dispose of in a legal manner.

- D. Provide on-site transportable cart containers for collection of waste materials, debris and rubbish.

1.20 TEMPORARY MAILBOX

- A. Within 7 days from the start of construction, provide a temporary mailbox.
- B. Identify street number on mailbox.

1.21 HAZARDS CONTROL

- A. Store volatile wastes in covered metal containers and remove from premises daily.
- B. Prevent accumulation of wastes that create hazardous conditions.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Comply with applicable requirements specified in Division 15 - Mechanical) and in Division 16 - Electrical.
- B. Maintain and operate systems to assure continuous service.
- C. Modify and extend systems as work progress requires.

END OF SECTION

Forms referenced in this Section available in TGI Friday's Construction Handbook:

Security Work Order, TGIF Form

Visitor Sign-In Sheet, TGIF Form

SECTION 01570

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section pertains to the provisions for the control of erosion in the construction area and in stockpile areas including seeding, sodding, hydromulching, silt fences, sediment barriers, the construction of temporary swales and sedimentation basins as required and shown on the drawings.
- B. Contractor is responsible for meeting all local, state and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System (NPDES) regulations from the Federal Clean Water Act.

1.2 NOTICE OF INTENT

- A. Contractor and Owner shall jointly submit an EPA Notice of Intent (NOI) prior to construction.

PART 2 PRODUCTS

2.1 GRASS

- A. Materials for seeding and sodding shall conform to Section 02905.

2.2 FERTILIZER

- A. Use commercial grade fertilizers to insure germination and growth. Analysis by weight shall be 16-4-8 or 15-5-10 for Nitrogen, Phosphoric Acid and Potash.

2.3 WATER

- A. Use clean potable water for maintaining the grass.

2.4 SILT FENCE

- A. Lundin "Silt Buster", Mirafi "Envirofence" or approved equal.

2.5 STRAW BALES

- A. Standard rectangular hay bales bound by baling wire

2.6 SEDIMENT TRAPS

- A. Standard manufacture designed to fit the intended inlet.

PART 3 EXECUTION

3.1 GENERAL

- A. Contractor shall keep disturbed areas to a minimum required to adequately perform the work. At all times the Contractor shall maintain the site in such a manner that minimizes erosion of the site. The execution of work under this section shall be in conformance with the NPDES rulings and the site Storm Water Pollution Prevention Plan.

3.2 SEEDING

- A. Disturbed portions of the site and stockpile areas shall be seeded within 14 days if the phasing of the construction operations are anticipated to leave those portions of the areas unworked for 21 days or more.
- B. Seeding operations shall be performed in accordance to the state's Standard Specifications, using the materials specified for that District and the season in which the seeding operations are to occur.

- C. Seeded areas shall be maintained until the project is accepted by the Owner. Maintenance shall include but not be limited to watering, fertilizing, reseeding, mowing and erosion repair as may be required. Grass shall be cut when the average height of the grass reaches 6 inches. Clippings may be mulched back into the seeded areas.

3.3 TEMPORARY AND PERMANENT SWALES

A. Description

1. Temporary and permanent drainage swales shall be provided as required to carry drainage away from the work area to an approved outfall point.
2. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least 2 feet deep with a slope of 0.1 percent.
3. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.
4. Swales shall have erosion control barriers as required.
5. All permanent swales shall be sodded to a minimum width of 10 feet on either side of the centerline of the swale.

B. Maintenance

1. During the course of construction all temporary swales constructed for this contract shall be maintained so as to allow proper drainage from the construction area. Before Contractor leaves the site at the end of construction, all temporary swales to remain shall be placed in good working condition.
2. Contractor shall work with other contractors at the site in maintaining existing swales and ditches.
3. Where necessary for access to the work areas, adequately sized culverts shall be installed and maintained to provide the access without disturbing the site drainage.
4. Care shall be taken not to rut and damage sodded swales. Damaged swales shall be repaired immediately.
5. Keep sodded swales mowed.

3.4 DRAINAGE DITCHES

- A. Drainage ditches shall be hydromulched immediately upon final grading.
- B. Erosion of the banks of the drainage ditches shall be repaired immediately and re-stabilized.
- C. Sediment barriers shall be placed at intervals along the ditch as shown on the plans and as necessary to help trap sediment on the site. Sediment and other debris trapped by the barriers shall be removed on a daily basis as needed.
- D. Ditch side slopes shall not be steeper than 3 feet horizontal to 1 foot vertical.
- E. Maintenance of the ditches during construction shall include but not be limited to mowing, re-grading, sediment removal, re-hydromulching, bank repair, and debris removal.
- F. Sediment removed from the ditches may be respread on the site as directed by the Owner.

3.5 FILL AND CUT SLOPES

- A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's soils engineer.
- B. When cut slopes exceed 2:1 for depths over 3 feet, proper bracing and shoring per OSHA requirements shall be used and maintained.
- C. For permanent slopes, cut or fill, between 2:1 and 10:1, erosion protection shall be provided with hydromulching, sodding, seeding, or other method as approved.

3.6 SEDIMENTATION BASINS

A. Description

1. Sedimentation ponds shall be provided where designated on the plans.
2. All drainage from cleared areas shall be routed through the sedimentation basin.

3. Contractor will be responsible for the operation and maintenance of the pond during construction.
- B. Maintenance
1. Contractor shall be responsible for maintaining the pond and the outfall and sediment retarding structure in good working condition throughout the time the pond is to be in operation.
 2. When sediment and debris fill the pond to over 1/3 its designed capacity, the pond shall be cleaned out.
 3. The sediment from the clearing operation shall be stockpiled in its own separate area or removed from the site, as required, and adequate drainage provisions must be made such that drainage from the sediment stockpile drains back into the sediment pond. When approved by the Owner, sediment removed from the pond may be spread over the site.

3.7 EROSION CONTROL BARRIERS

- A. Erosion control barriers shall be provided at intervals along swales and ditches as shown on the drawings and as necessary to meet the requirements of the Storm Water Pollution Prevention Plan.
- B. The barriers shall be silt fence or hay bales placed as shown on the drawings and details.
- C. Barriers shall be maintained in good working condition and replaced when damaged.

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes:
 - 1. Signs: Except for specified sign, no other construction signs will be allowed on site.

1.2 QUALITY ASSURANCE

- A. Sign: Construct and install to withstand 50 mph wind velocity.
- B. Graphics Painter: Professional sign painter, minimum 2 years experience.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- D. Permit: Obtain and pay for permit that may be required to display sign on Project site. Coordinate requirements with local jurisdiction.

PART 2 PRODUCTS

2.1 SIGN MATERIALS

- A. Support Structure and Framing: Mount 4 by 4 inch cedar or redwood posts, set 4 feet into ground, with 6 feet clearance from ground to bottom of sign. Brace each post back to ground with 2 by 4 inch brace.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 23/32 inch thick, sized to minimize joints.
- C. Nails, Bolts, Fasteners, Hook and Eye Bolts: Types and sizes as required, galvanized or corrosion resistant.
- D. Primers and Paints: Exterior type, colors as selected by Architect, 2 coats consisting of an appropriate primer followed by one coat of paint for support structure, framing and sign surfaces.
- E. Graphics: Refer to Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install project identification sign within 7 days after commencement of construction.
- B. Install assembly plumb and level, rigidly braced, framed, and anchored to resist wind load.
- C. Maintain signs; repair deterioration and damage.
- D. Remove signs, framing, supports, and foundations at completion of Project and restore area.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
 - 2. Packaging, transportation, delivery, receiving, storage, protection and other product handling requirements.
 - 3. Product options and substitutions including:
 - a. Contractor's options in selection of products.
 - b. Products list.
 - c. Requests for substitution of products.
- C. Owner Provided Products: Refer to Section 01640.

1.2 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment", is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.3 PRODUCT LIST

- A. Prepare a schedule showing products specified in a tabular form acceptable to the Owner. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- C. Coordinate the product list schedule with the Contractor's Construction Schedule.
- D. Form: Prepare the product listing schedule with information on each item tabulated under the following column headings:
 - 1. Related Specification Section number.
 - 2. Generic name used in Contract Documents.
 - 3. Proprietary name, model number and similar designations.
 - 4. Manufacturer's name and address.
 - 5. Supplier's name and address.
 - 6. Installer's name and address.
 - 7. Projected delivery date, or time span of delivery period.

- E. Initial Submittal:
 1. Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list schedule.
 2. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
 3. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.
- F. Completed Schedule:
 1. Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list schedule.
 2. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
- G. Owner's Construction Manager's Action:
 1. Owner's Construction Manager will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule.
 2. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.
 3. The Owner's Construction Manager's response will include the following:
 - a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.4 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
 1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Owner's Construction Manager for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources whose products possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
 1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
- D. Matching of Colors:
 1. When a product is listed in the specifications with an accompanying color, pattern, texture, or sheen, provide only that product, or one that is identical in color, pattern, texture, and sheen to the product specified, regardless if the color, pattern, texture, or sheen of the alternate manufacturer's product is a standard or option.

2. On finished materials and products, verify that colors, patterns, textures, and sheens are identical for the entire project and that there are no visual differences between batches, packages, bundles, or shipments, due to differing production runs. Architect and Owner's Construction Manager reserve the right to reject products and materials installed, which have, in the opinion of the Architect or Owner's Construction Manager, a significant enough difference in color, pattern, texture, or sheen, from other products on the project, so as to be visually distracting.

1.5 OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named within time frame specified herein.
- C. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications; no options, no substitutions.
- D. Products Specified by Naming Only One Manufacturer: No option; no substitution allowed.

1.6 SUBSTITUTIONS

- A. Limitations:
 1. During Bidding period, Instructions to Bidders govern times for submitting requests for substitutions under requirements specified in this Section.
 2. Requests for substitutions of products will be considered only in case of product unavailability or other conditions beyond control of Contractor.
 3. Substitutions will not be considered:
 - a. When indicated on shop drawings or product data submittal without separate formal request.
 - b. When requested directly by subcontractor or supplier.
 - c. When acceptance will require substantial revision of Contract Documents.
 - d. When contractor or subcontractor failed to order specified product with ample lead time for fabrication and/or delivery.
 4. Do not order or install proposed substitute products without written acceptance.
 5. Only one request for substitution for each product will be considered. When substitution is not accepted, provide specified product.
 6. Owner's Construction Manager will determine acceptability of substitutions.
- B. Requests for Substitutions:
 1. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents. Utilize substitution request form attached.
 2. Identify product by Specifications section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.
 3. Attach product data as specified in Section 01330.
 4. List similar projects using product, dates of installation, and names of Architect and Owner.
 5. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specifications section and Article numbers.
 6. Give quality and performance comparison between proposed substitution and the specified product.
 7. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Sum.
 8. List availability of maintenance services and replacement materials.
 9. State effect of substitution on construction schedule, and changes required in other work or products.

- C. Contractor Representation:
 1. Request for substitution constitutes a representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product or that the cost reduction offered, if any, is ample justification for accepting the offered substitution.
 2. Provide same warranty for substitution as for specified product.
 3. Coordinate installation of accepted substitute, making such changes as may be required for Work to be complete in all respects.
 4. Certifies that cost data presented is complete and includes related costs under this Contract.
 5. Waives claims for additional costs related to substitution which may later become apparent.
- D. Submittal Procedures:
 1. Submit 3 copies of request for substitution.
 2. Architect will review Contractor's requests for substitutions with reasonable promptness.
 3. During the bidding period, Architect will record acceptable substitutions in Addenda.
 4. After award of Contract, Architect will notify Contractor, in writing, of decision to accept or reject requested substitution, generally within 14 days.
 5. For accepted products, submit shop drawings, product data, and samples under provisions of Section 01330.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 2. Semi-Proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
 - a. Where products or manufacturers are specified by name, comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Architect's or Owner's Construction Manager's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect or Owner's Construction Manager will select the color, pattern and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection, and for procedures required for processing such selections.

PART 3 EXECUTION

3.1 PACKAGING AND TRANSPORTATION

- A. Require supplier to package products in boxes or crates for protection during shipment, handling, and storage. Protect sensitive products against exposure to elements and moisture.
- B. Protect sensitive equipment and finishes against impact, abrasion, and other damage.

3.2 DELIVERY, RECEIVING, AND HANDLING

- A. Deliver, receive, and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft
- B. Delivery:
 1. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.
 2. Coordinate deliveries to avoid conflict with Work and conditions at site; limitations on storage space; availability of personnel and handling equipment, and Owner's use of premises.
 3. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
 4. 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.
 5. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 6. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

- C. Receiving and Handling:
 - 1. Provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.
 - 2. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.
 - 3. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.
 - 4. Immediately on delivery, inspect shipment to assure:
 - a. Product complies with requirements of Contract Documents and reviewed submittal.
 - b. Quantities are correct.
 - c. Accessories and installation hardware are correct.
 - d. Containers and packages are intact and labels legible.
 - e. Products are protected and undamaged.

3.3 STORAGE

- A. General:
 - 1. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.
 - 2. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.
 - 3. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
- B. Enclosed Storage:
 - 1. Store products, subject to damage by the elements, in substantial weathertight enclosures.
 - 2. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
 - 3. Provide humidity control and ventilation for sensitive products as required by manufacturer's instructions.
 - 4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
- C. Exterior Storage:
 - 1. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
 - 2. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.
 - 3. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
 - 4. Provide surface drainage to prevent erosion and ponding of water.
 - 5. Prevent mixing of refuse or chemically injurious materials or liquids.
- D. Maintenance of Storage:
 - 1. Periodically inspect stored products on a scheduled basis.
 - 2. Verify that storage facilities comply with manufacturer's product storage requirements.
 - 3. Verify that manufacturer required environmental conditions are maintained continually.
 - 4. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.
- E. Maintenance of Equipment Storage:
 - 1. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.
 - 2. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a record document.

3.4 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

Attachment: Substitution Request Form

SUBSTITUTION REQUEST FORM

DATE: _____
Architect's Project No: _____

Project: _____

To: _____ From: _____

=====
Contractor (Bidder) hereby request acceptance of the following product or system as substitution in accordance with provisions of Section 01600 of the Specifications:

1. SPECIFIED PRODUCT OR SYSTEM:

Substitution request for: _____

Specification Section No: _____ Article: _____

2. SUPPORTING DATA:

_____ Product data adequate for evaluation of the request for proposed substitution is attached (description of product, reference standard, performance and test data, specifications, drawings, photographs).

_____ Sample is attached.

_____ Sample will be sent if requested.

3. QUALITY COMPARISON

	SPECIFIED PRODUCT	SUBSTITUTION
Name, Brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant Variations:	_____	_____

(Add Additional Sheets If Necessary)

Maintenance Service Available: Yes _____ No _____

Spare Parts Source: _____

Warranty Provided: Yes _____ No _____ Years _____

By Whom: _____

4. PREVIOUS INSTALLATIONS:

Identification of similar projects on which proposed substitution was used:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

5. REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

6. EFFECT OF SUBSTITUTION:

Does the proposed substitution affect other work (adverse or otherwise):

No _____ Yes _____ (if yes, explain)

Substitution Changes Contract Time: No _____ Yes _____
Add/Deduct _____ Days

Substitution requires dimensional revisions or redesign of the work: No _____ Yes _____ (if yes, attach explanation data)

Saving of credit to Owner: \$ _____

Extra Cost to Owner: \$ _____

7. CONTRACTOR'S (BIDDER'S) STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT DOCUMENTS:

I/we have investigated the proposed substitution. I/we:

- believe that it is equal or superior in all respects including function, appearance and quality to specified product, except as stated above;
- will provide same warranty and servicing requirements as specified for specified product;
- have included complete cost data and implications of the substitution;
- will pay for changes to the building design and special inspection costs caused by the use of this product;
- will coordinate the incorporation of the proposed substitution in the work;
- waive future claims for added cost to Contract caused by the substitution.

Contractor (Bidder): _____

Date: _____ By: _____

Answer all questions and complete all blanks - use "NA" if not applicable. Unresponsive or incomplete request will be rejected.

=====

ARCHITECT'S REVIEW AND ACTION

_____ Resubmit substitution request

_____ Provide more information in the following areas:

_____ Sign Contractor's (Bidder's) Statement of Conformance

_____ Substitution is accepted.

_____ Substitution is accepted, with the following comments:

_____ Substitution rejected.

_____ Substitution Request received too late.

Architect

Date: _____

SECTION 01640

OWNER-FURNISHED PRODUCTS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Owner-Furnished, Owner Installed Products (OFOI).
 - 2. Owner-Furnished, Contractor Installed Products (OFCI).

1.2 GENERAL

- A. Allow for receiving, storing, and handling of Owner Furnished Owner Installed (OFOI) items as indicated, in accordance with provisions of Contract Documents.
- B. Allow for ordering, receiving, storing, handling, assembly (as required), and installation of Owner Furnished Contractor Installed (OFCI) items as indicated, in accordance with provisions of Contract Documents.
- C. Coordinate with work of other trades.
- D. Although such work is not specifically indicated, furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.3 SUBMITTALS

- A. Owner fabrication plant to provide shop drawings to Contractor for Owner fabricated items that are built-in or require close tolerance clearances in the construction. Review shop drawing and within 30 days of receipt acknowledge receipt and approval.
- B. Within 30 days of Notice to Proceed, check quantities and dimensions and verify to Owner and Architect.
- C. Owner fabricated items are not subject to change without prior approval of Owner or Architect.
- D. Provide modifications required by variable field conditions at no additional cost to Owner.
- E. Delivery memoranda.

1.4 ADDITIONAL REQUIREMENTS

- A. Within 60 days of Notice to Proceed:
 - 1. Submit quantity validation to Owner.
 - a. Indicate quantities of all items.
 - 2. Coordinate delivery dates with Construction Delivery Schedules issued by Owner.
- B. Owner will deliver materials to Contractor's on site storage area. Furnish equipment and labor for unloading and storing materials.
- C. Unload, properly store and protect from time of delivery until installation and acceptance. Make claims for re-priming or refinishing of Owner-Provided products within 30 days of receipt of material or items.
- D. Requests for changes in the delivery dates must be received by the Owner at least 2 weeks prior to the originally scheduled date and must be necessitated by an Owner approved change in the CPM. Contractor will be assessed a storage and handling fee for any non-approved changes to the original delivery schedule.
- E. Assemble, install, connect, adjust, and finish products.
- F. Provide installation inspections required for public authorities.
- G. Repair or replace items damaged by Contractor.

H. CONSTRUCTION CHECK LIST

The following checklists are provided as an aid in helping the contractor verify that they are ready for the delivery of Owner Provided items or ready for the installation of certain equipment that is to be installed by our vendors. The check lists also help as a guide for staying on schedule. They are for your use and are not required to be submitted to TGI Friday's.

Failure of the contractor to complete any of the items on the check lists prior to the date established by the construction delivery schedule for the delivery of Owner Provided items could result in back charges from TGI Friday's to cover additional costs incurred for storage or extra delivery trips by TGI Friday's vendors.

WALK-IN COOLERS AND FREEZER

When unloading use extreme caution, do not use fork lifts to unload. The panels must be unloaded by hand. The panels are subject to damage on the edges if handled roughly. It will require approximately four people one hour to unload and store the panels. All walk-ins are to be stored inside the building and out of the weather - panels must not be allowed to get wet (refer to manufactures recommendations that come with the panels),. You must protect the panels with temporary plastic if building is not water proof.

ITEMS TO BE COMPLETED PRIOR TO WALK-IN DELIVERY:

All concrete poured in kitchen and storage areas. Concrete floor area immediately under coolers should be level and true.

Exterior wall finishes must be complete.

Area where walk-ins are to be installed is to be free of debris.

STORAGE OF WALK-IN PANELS:

1. The cooler/freezer panels should be stacked flat no more than eight (8) panels high to prevent warpage.
2. Do not store panels directly in the areas where they are to be installed.
3. Walk-in threshold should not be installed until after the quarry tile has been set.
4. If it is necessary to store the walk-ins off the slab, then 2x material should be placed on the ground in a level position with a minimum of 4" clearance.
5. Panels should be covered to protect them from the weather. Whether stored in the building or on the site.

Failure of the contractor to complete the above items prior to the given date of arrival could result in backcharges from TGI Friday's, Inc. to cover additional costs for storage, etc.

CUSTOM FABRICATED STAINLESS KITCHEN & BAR EQUIPMENT

This delivery date is extremely important. The date determines the arrival of the buy-out kitchen equipment, beer system and soda system. The following list must be reviewed three (3) weeks prior to delivery to assure installation as scheduled.

ITEMS TO BE COMPLETED PRIOR TO KITCHEN EQUIPMENT DELIVERY:

All quarry tile and cove base installed in the kitchen, main bar, service bar, dry goods and walk-ins (including grouting and cleaning).

Fiberglass wall panels installed in kitchen and service bar.

All walls painted in kitchen area and dry storage areas.

All wall tile and stainless steel wall paneling installed, except at Pizza Oven.

Laminated plastic covered plywood panels installed at inside face of bar walls.

Bar top installed.

Kitchen exhaust hood and overhead duct installed.

Pull boxes for refrigeration lines installed.

Gas lines complete to chase or stubbed out.

Adequate lighting in place and operable.

Wires pulled to all load centers and ready for final connection.

208V single-phase power available inside of building for field welding

Building secure.

The kitchen, coolers, freezer and main bar must be clear of construction tools, debris and trash.

Service court & rear entry door concrete ramps should be in place (if applicable)

Failure of the contractor to complete the above items prior to the date of arrival could result in backcharges from TGI Friday's, Inc. to cover additional costs for storage, additional delivery trips or delay of other installers.

BEER AND SODA LINE INSTALLATION

ITEMS TO BE COMPLETED PRIOR TO INSTALLATION BY TGIF VENDOR:

PLUMBING:

Beverage chases have been cut to 6" above floor to facilitate installation of insulated trunk lines.

Beverage chases have been checked and purged of all water and debris.

Permanent uninterrupted water supply is available.

ELECTRICAL:

120V, 2-pole 3-wire, single-phase, 20 Amp permanent power is operational at the soda system cooling unit.

120V, 2-pole 3-wire, single-phase, 20 Amp permanent power is operational at the beer system cooling unit

120V, 2-pole 3-wire, single-phase, 20 Amp permanent power is operational at the air compressor / blender station.

MILLWORK:

Bar die wall is ready to receive insulated trunk lines.

Bar top and stainless steel shot rail are installed and bar top is ready to be cut for beer towers.

Bar equipment is set and inside bar face is ready to be cut for soda guns.

REFRIGERATION:

Walk-in beer cooler is operational.

Beer keg racks are put together and set in place in walk-in beer cooler.

Failure of the contractor to complete the above items prior to the date of vendor arrival could result in back charges from TGI Friday's, Inc. to cover additional trip costs and equipment storage.

SAFE

Upon delivery of the safe to the job site the superintendent shall unload and move into place.

ITEMS TO BE COMPLETED PRIOR TO SAFE DELIVERY:

Office floor tile and base installed

J-box for security cabling installed with pull strings in place.

Failure of the contractor to complete the above items prior to the date of arrival could result in back charges from TGI Friday's, Inc. to cover additional delivery costs and storage.

POINT OF SALE (POS) EQUIPMENT (Micros)

ITEMS TO BE COMPLETED PRIOR TO POS EQUIPMENT DELIVERY:

All POS outlets are on dedicated circuits with independent grounded simplex receptacles **(orange face plates)** installed and operational.

All Point of Sale communications cabling has been installed in metal conduit with 2' pigtail at each end.

All card check outlets are on dedicated circuits with independent grounded duplex receptacles **(orange face plates)** installed and operational.

No POS or card check circuits share the same conduit.

All printer electrical outlets are dedicated with independent grounded simplex receptacles **(orange face plates)** are installed and operational. One at each location.

4 x 4 j-box is installed just below ceiling above safe in office for INS cabling GNA1, GNA2 etc. Run conduit to above ceiling.

COMMONLY MISSED DETAILS:

- All circuits for the POS system shall be single, dedicated and independently grounded as indicated by the orange outlet color. No other items shall be plugged into these outlets as it may cause damage to the entire system.

Failure of the contractor to complete the above items prior to the date of arrival could result in backcharges from TGI Friday's, Inc. to cover additional delivery costs and storage.

SPEED OF SERVICE EQUIPMENT

ITEMS TO BE COMPLETED PRIOR TO TGI SERVICE EQUIPMENT DELIVERY:

All 15 AMP independent grounded circuits and quad receptacles (**orange face plates**) have been installed (one at CPU shelf, one for all monitors, two in the office just below the ceiling above the safe

All monitor-mounting brackets have been installed 18" clear of fire suppression system.

All monitor cabling has been run from CPU shelf to monitor locations with all excess cabling coiled above the ceiling at the monitor side. Do not run over fluorescent light fixtures or near any transformers.

Two 4x4 j-boxes are installed with conduit to above ceiling for network cabling at CPU shelf.

Two 4x4 j-boxes are installed with conduit to above ceiling for network cabling in the office just below the ceiling above the safe.

Electrical outlets at all monitor locations are independent grounded (**orange face plates**) simplex receptacles.

Electrical outlets for the sell check printers are independent grounded (**orange face plates**) duplex receptacles.

COMMONLY MISSED DETAILS :

- All circuits for TGI Service shall be single, dedicated and independently grounded as indicated by the orange outlet color. No other items shall be plugged into these outlets as it may cause damage to the entire system.

Failure of the contractor to complete the above items prior to the date of arrival could result in backcharges from TGI Friday's, Inc. to cover additional delivery costs and storage.

AIR BALANCING

To insure a proper balanced air flow within the front line hood and the building HVAC systems, TGI Friday's will contract with an independent air balance contractor to provide on-site balancing. The HVAC subcontractor shall assist the technician in accomplishing his work.

ITEMS TO BE COMPLETED 2 WEEKS PRIOR TO AIR BALANCING:

Air Conditioning Units

Units installed are of proper size and are in correct location.

Horsepower of each Fan Motor is as size scheduled on mechanical plans.

Thermostats installed in accordance with mechanical plans.

Exhaust Fans

Fans installed are of proper size and are in correct location.

Horsepower of each Fan Motor is as size scheduled on mechanical plans.

Make-up Fans

Units installed are of proper size and are in correct location.

Horsepower of each Fan Motor is as size scheduled on mechanical plans.

Duct Work

Volume dampers have been installed

Turning vanes have been installed at all 90° elbows.

All ductwork is externally insulated so that no sheet metal is exposed.

All ductwork serving combi hood, broiler hood, sauté hood, (2) broiler 2 hoods, pizza hood, and dishwasher have been continuously welded.

Exhaust ductwork has been properly sealed at roof curb

ITEMS TO BE COMPLETED 1 WEEK PRIOR TO BALANCING:

Verify that the following has been completed for each air conditioning unit:

The cooling and heating systems are operational

The return air and outside air motorized dampers are operational

The controls are operational

New 2" filters have been installed before the air balance is to start

All duct heaters are wired and operational

All exhaust and make-up fans are wired and operational

Make-up air and exhaust fans serving hoods are properly interlocked

COMMONLY MISSED DETAILS :

- | | |
|---|------------------------------------|
| Back draft dampers are not installed in toilet exhaust. | 2" filters not installed |
| Exhaust fans are mounted in wrong locations | Thermostats are not wired |
| Motors are wired to incorrect voltage | Duct heaters are not wired |
| Service disconnects are not installed on roof | Outside air dampers not wired |
| Motors are wired such that fan rotation is incorrect | Economizer installation incomplete |
| Motor overload protectors are not properly sized | Improper staging on cooling coils |
| Condensate drain lines not properly installed | Unit electric heaters not wired |
| Splitters not installed per mechanical plans | Unit gas heaters not purged |

Failure of the contractor to complete the above items prior to the date of vendor arrival could result in backcharges from TGI Friday's, Inc. to cover additional trip costs and equipment storage.

DISHWASHER START UP

ITEMS TO BE COMPLETED PRIOR TO START UP BY TGIF VENDOR:

PLUMBING:

- 3/4" Hot water connected to machine
- 2" wash tank drain line plumbed to floor drain/sink
- 3/4" rinse drain line plumbed

ELECTRICAL:

- All electrical connections to meters and controls complete
- Vent control package hooked up at machine controls

GENERAL:

- Limit switch installed and operable and clean dish table
- Water heater installed and operable with hot water at machine

Failure of the contractor to complete the above items prior to the date of vendor arrival could result in backcharges from TGI Friday's, Inc. to cover additional trip costs and equipment storage.

HOOD FIRE PROTECTION

ITEMS TO BE COMPLETED PRIOR TO INSTALLATION BY TGIF VENDOR:

ELECTRICAL:

Electrical wiring is complete for all equipment under hood

All electrical equipment under the hood is operational

PLUMBING:

Gas valve has been installed.

Gas line has been installed and hooked up to all equipment under the hood.

All gas equipment under the hood is operational.

Failure of the contractor to complete the above items prior to the date of vendor arrival could result in backcharges from TGI Friday's, Inc. to cover additional trip costs and equipment storage.

TELEPHONE INSTALLATION

ITEMS TO BE COMPLETED PRIOR TO INSTALLATION OF OWNER'S TELEPHONE SYSTEMS:

When TGIF vendors arrive onsite they will check in with the superintendent. Then make a list of the items found to be incomplete. The contractor is requested to complete those items immediately to keep TGIF vendors from leaving prior to completing their work.

Should you have any problems, questions or require additional information relating to the telephone system please contact your Friday's project manager.

Mechanical / Electrical room

π 2' x 4' x 1/2" plywood backboard installed 5 feet above the floor to centerline in accessible area.

π Conduit for 25-pair telephone service has been run to the mech / elect. room

π Telephone voice service has been installed by local telephone company.

Electrical

π J-boxes installed and conduit run to above the ceiling.

π High quality four (4) pair CAT III Plenum Cable telephone lines pulled with proper jacks installed. Lines must be labeled in mech / elec room.

π 120 V dedicated duplex outlet installed at backboard.

π Conduit run from telephone board to above safe in office for 56K data circuit.

Failure of the contractor to complete the above items prior to the date of vendor arrival could result in back-charges from TGI Friday's, Inc. to cover additional trip charges, delivery costs and/or storage.

FIRE PROTECTION / SECURITY

ITEMS TO BE COMPLETED PRIOR TO INSTALLATION OF OWNER-INSTALLED FIRE AND SECURITY SYSTEMS:

Security

- All exterior doors and office door installed with 3/8" hole drilled in the top of the frame on the strike side of the door that connects to 1/2" conduit extending above the ceiling. Provide pull string.
- J-box installed at 54" AFF for safe contacts in office
- Safe installed.
- Conduit installed 4" from the hinge side of the walk-in cooler doors extend from 12" AFF to above the ceiling for hold up contacts in each of the walk-in cooler, freezer and beer cooler.
- J-box installed under counter top in office for office hold-up button with 1/2" conduit and pull string to above ceiling.
- J-box and conduit installed at roof hatch (if applicable)
- J-boxes installed at 54" AFF for keypad in office and adjacent to hostess stand at front entry with 1/2" conduit and pull string to above ceiling.

Fire Protection

- Fire and security plywood backboard mounted above ceiling at office door.
- 110 V dedicated duplex outlet installed at plywood backboard.
- Two telephone lines installed at plywood backboard.
- Office walls to be finished where panels are to be installed.

Failure of the contractor to complete the above items prior to the date of arrival could result in backcharges from TGI Friday's, Inc. to cover additional delivery costs and storage.

1.5 HANDLING

- I. Submit orders and delivery schedule to and coordinate with Owner.
- J. Receive fabricated items.
- K. Report damaged materials to Owner within 3 days of delivery.
- L. Assist Owner in return of damaged items to fabrication plant for repair or re-manufacture (packaging and loading).

1.6 OWNER-FURNISHED PRODUCTS

- M. Owner Responsibilities
 1. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
 2. Deliver supplier's bill of materials to Contractor.

3. Arrange and pay for delivery to site in accordance with Progress Schedule.
 4. Submit claims for transportation damage.
 5. Arrange for replacement of damaged, defective, or missing items.
 6. Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- N. Contractor Responsibilities
1. Designate submittals and delivery date for each product in Progress Schedule.
 2. Review shop drawings, product data, samples, and other submittals. Submit to Architect with notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 3. Receive and unload products at site.
 4. Inspect deliveries, record shortages, and damaged or defective items.
 5. Handle products at site, including uncrating and storage.
 6. Protect products from damage, and from exposure to elements.
 7. Assemble, install, connect, adjust, and finish products.
 8. Provide installation inspections required by public authorities.
 9. Repair or replace items damaged by Contractor.
- O. Definitions:
1. OFOI - Owner Furnished Owner Installed.
 2. OFCI - Owner Furnished Contractor Installed.
- P. Schedule of Owner-Furnished Items
1. Refer to Schedule on Drawings.

PART 2 PRODUCTS

2.1 CONTRACTOR ITEMS

- A. Furnish required hardware for items indicated not to be included with attached Owner furnished items list or drawings.
 1. Provide and install embeds required for Owner furnished materials.
- B. Division 15: Perform utility work and connections.
- C. Division 16: Perform wiring and connections.

PART 3 EXECUTION

3.1 DELIVERY SCHEDULE

- A. The delivery of each item is in conjunction with the Construction Delivery Schedule provided each week by the Construction Manager.
- B. On most items, 24 hours notice will be given to the Contractor by the carrier prior to delivery.

3.2 RECEIVING PROCEDURES

- C. Verify quantity of containers. Compare to delivery ticket and note discrepancies.
- D. Inspect exterior of containers for damage and note on delivery ticket.
- E. If exterior damage is found:
 1. Damaged freight must be reported to the carrier.
 2. Keep boxes, crates, packing materials, etc. to ensure freight claim recovery.
 3. Call the carrier's local office and arrange for an inspection of the damage at the job site.
 4. Forward carrier's claim forms to Owner.
 5. Under no circumstances shall any boxes, crates, or packing materials for any damaged items be discarded until claims have been finalized, whether the damage has been interior or exterior.
- F. If there is no physical exterior damage, immediate inspection of the contents is not required. However, within 3 working days of receipt, containers shall be opened to verify condition and quantity of contents.

1. Note any discrepancies on packing slip that is enclosed in the container and fax the packing slips along with the signed memorandums to the Owner. If replacement of an item is critical, contact the Construction Manager immediately.
 2. No Owner provided item may be replaced by Contractor without authorization from the Construction Manager.
- G. Refer to TGI Friday's Construction Handbook for Owner's contact addresses and telephone numbers for execution of these requirements.

3.3 DELIVERY MEMORANDA

- H. Refer to TGI Friday's Construction Handbook for appropriate form and facsimile number.
- I. Complete the form indicating information noted.
- J. Send the form via facsimile to the Owner no later than 3 days after receipt of the delivery.
- K. Replacement costs and transportation expense of items not correctly documented at receipt of delivery that require repurchasing for use in the project will include a 20 percent mark up on actual costs for handling, and will be back charged to the Contractor on the final pay request.

3.4 INSTALLATION

- L. See respective specification sections and drawings for installation requirements.
- M. Perform field required assembly.
- N. Furnish required anchoring devices.
- O. Perform field painting.
- P. Leave items clean and ready for use.

END OF SECTION

Forms referenced in this Section available in TGI Friday's Construction Handbook: Delivery Memoranda

SECTION 01725

FIELD ENGINEERING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Surveying and Field Engineering services.
 - 2. Contractor will identify control points and property line corner stakes.

1.2 QUALITY CONTROL

- A. Land Surveyor: Registered in the State in which Project is located, and acceptable to Owner's Construction Manager.
- B. Professional Engineer: Registered Professional Engineer of the discipline required for specific service and licensed in the State in which Project is located.

1.3 SUBMITTALS

- A. Submit name, address, and telephone number of Surveyor and Engineer before starting survey work.
- B. On request, submit documentation verifying accuracy of survey work.
- C. Submit certificate signed by Surveyor Engineer, certifying that elevations and locations of improvements are in conformance, or nonconformance, with Contract Documents.

1.4 PROJECT RECORD DOCUMENTS

- A. Maintain complete, accurate log of control and survey work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare a certified survey showing dimensions, locations, angles, and elevations of construction.
- C. Submit Record Documents under provisions of Section 01780.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify locations of survey control points prior to starting work. Promptly notify Owner's Construction Manager of any discrepancies discovered.

3.2 SURVEY REFERENCE POINTS

- A. Locate and protect survey control and reference points.
- B. Control datum for survey is that indicated on Drawings.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction. Make no changes without prior written notice to Owner's Construction Manager.
- D. Promptly report to Owner's Construction Manager the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control.

3.3 SURVEY REQUIREMENTS

- A. Establish a minimum of one permanent bench mark on site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record Documents.

- B. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements, including pavements; stakes for grading, fill and topsoil placement; and utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, and ground floor elevations.
 - C. Periodically verify layouts by same means.
 - D. Prepare certified survey showing dimensions, locations, angles, and elevations of construction and sitework on completion of foundation walls, major site improvements, and other work requiring surveying.
- 3.4 FINAL PROPERTY SURVEY
- A. Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of buildings and site work that have resulted from construction indicating their relationship to permanent bench marks and property lines.
 - 1. Show significant features (real property) for Project.
 - 2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.
 - 3. Locate and mark property corners with irons or monuments.
 - 4. Indicate easements, restrictions, building set back lines, right-of-way, pole lines, and other relative facts that may affect future work.
 - 5. Certify that survey was performed within one month of completion.
 - 6. Show topography 50 feet outside property lines, including floor elevation of buildings on adjacent properties.
 - 7. Include subsurface utilities, water lines, sewer lines, and electrical conduits.
 - 8. Show finish grades, fencing, landscaping, light poles, and buildings on developed properties.

END OF SECTION

SECTION 01731

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Requirements and limitations for cutting and patching of Work within new construction required to complete work or to make its several parts fit together.

1.2 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of the Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work, and products to be used.
 - a. Scope of cutting, fitting, patching, or alteration.
 - b. Listing of applicable trades.
 - c. Proposed products and materials.
 - d. Extent of refinishing.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on structural integrity of Work.
 - 7. Effect on weatherproof integrity of Work.
 - 8. Effect on building's appearance and significant visual elements.
 - 9. Effect on utilities:
 - a. List of utilities affected by cutting and patching.
 - b. List of utilities that will be relocated.
 - c. List of utilities that will be temporarily out-of-service. Indicate time period of service outage.
 - 10. Effect on work of Owner or separate contractor.
 - 11. Written permission of affected separate contractor.
 - 12. Date and time work will be executed.
- C. Should conditions or schedule require change of products or methods different than original installation, submit written recommendation to Construction Manager explaining conditions necessitating change and requirements of alternative materials or methods.
- D. Approval by Owner's Construction Manager to proceed with cutting and patching does not waive Owner's Construction Manager's right to later require complete removal and replacement of unsatisfactory work.

1.3 PAYMENT FOR COSTS

- A. Costs resulting from ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional services of Architect, or other consultants shall be borne by the party responsible for ill-timed, rejected or non-conforming Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Products: Those required for original installation.
- B. For any change in materials, submit request for substitution under provisions of Section 01600.

PART 3 EXECUTION

3.1 GENERAL

- A. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical work.

3.2 INSPECTION

- A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.3 PREPARATION

- A. Provide temporary supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas that may be exposed by uncovering work; maintain excavations free of water.
- C. Provide materials and control operations to prevent spread of dust in surrounding area. Provide drop cloths or other suitable barriers.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Avoid cutting in service pipes, ducts, or conduit until provisions have been made to bypass them.

3.4 CUTTING AND PATCHING

- A. Execute cutting, fitting, and patching (including excavation and fill) to complete work.
- B. Fit products together, to integrate with other work.
- C. Uncover work to install ill-timed work.
- D. Remove and replace defective or non-forming work.
- E. Remove samples of installed work for testing when requested.
- F. Provide openings in the work for penetration of mechanical and electrical work.
- G. Uncover work to allow for Owner's Construction Manager's observation of covered work that has been covered up prior to required observation by Owner's Construction Manager.

3.5 PERFORMANCE

- A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
 - 1. Use hand or small power tools designed for sawing or grinding, not hammering or chopping.
 - 2. Cut holes and slots as small as possible, neatly to size required, with minimum disturbance of adjacent surfaces.
 - 3. Temporarily cover openings when not in use.

4. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed surfaces.
 5. Cut through concrete and masonry using cutting machine, such as, Carborundum saw or diamond-core drill.
- B. Execute in manner which does not void required or existing warranties.
 - C. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
 - D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 - E. Restore work with new products in accordance with requirements of Contract Documents.
 - F. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - G. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated packing material, full thickness of the construction element.
 - H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
 - I. Execute excavating and backfilling by methods in accordance with applicable Sections of Division 2 which will prevent settlement or damage to Project.
 - J. Execute fitting and adjustment to produce finished installation complying with specified products, functions, tolerances, and finishes.
 - K. Install products and materials to complete Work in accordance with requirements of Contract Documents.
 - L. Do not cut and patch structural elements in manner that would result in reduction of load carrying capacity or of load deflection ratio.
 - M. Do not cut and patch operational elements or safety related components in manner that would result in reduction of their capacity to perform in manner intended, including energy performance, that would result in increased maintenance, decreased operational life, or decreased safety.
 - N. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - O. At penetrations of fire-rated assemblies, completely seal with firestops in accordance with Section 07840.
 - P. Where utilities are to be removed, relocated, or abandoned, by-pass before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe, duct, or conduit to prevent entrance of moisture or matter after by-passing and cutting.
 - Q. Except where indicated otherwise, restore exposed finishes of patched areas to match existing and where necessary extend finish restoration into retained adjoining surfaces in manner which will eliminate evidence of patching and refinishing. Thoroughly clean surfaces prior to application of paint and other finishes.
 - R. Where patching occurs in previously painted surface, provide appropriate prime coat followed by first finish coat of paint. Provide final finish coat over entire area containing patch; for continuous surface extend to nearest vertical break or intersection, for an assembly refinish entire unit. Except where indicated otherwise, finish in sheen and color to match existing.

3.6 CLEANING

- A. Thoroughly clean areas and spaces affected by Work. Completely remove paint, mortar, oils, putty, and items of similar nature.
- B. Restore damaged surfaces to its original condition.

END OF SECTION

SECTION 01740

CLEANING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Cleaning during construction.
 - 2. Final cleaning of project and related site work.

1.2 CLEANING DURING CONSTRUCTION

- A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.
- B. Keep site and construction areas clean on a weekly basis.
- C. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.3 FINAL CLEANING

- A. Execute cleaning prior to inspection for Substantial Completion of the Work.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

- A. Use materials which will not create hazards to health or property, and which will not damage surfaces.
- B. Use only materials and methods recommended by manufacturer of material being cleaned.

PART 3 EXECUTION

3.1 CLEANING

- A. In addition to removal of debris and cleaning specified in other sections, clean interior and exterior exposed-to-view surfaces.
- B. Remove waste, foreign matter, and debris from roofs, gutters, area ways, and drainage systems.
- C. Cleaning during Construction:
 - 1. Execute periodic cleaning to keep building, site, and adjacent properties free of accumulations of waste materials, debris, rubbish, and wind blown debris resulting from construction operations.
 - 2. Prior to Substantial Completion remove construction tools, scaffolding, equipment, machinery, and surplus materials.
 - 3. Broom clean and vacuum interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
 - 4. Schedule cleaning operations so that dust and other contaminants will not fall on or adhere to wet or newly-coated surfaces.
 - 5. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing space.
 - 6. Store volatile wastes in covered metal containers and remove from premises daily. Prevent accumulation of waste that creates hazardous conditions. Provide adequate ventilation during use of volatile or noxious substances.
 - 7. Do not throw materials from heights.

8. Open free-fall chutes not permitted. Terminate closed chutes into appropriate containers with lids.
 9. Collect and remove waste materials, debris, and rubbish from site weekly until execution of final cleaning and dispose off site in lawful manner.
 10. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 11. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of volatile wastes or hazardous materials such as mineral spirits, oil, or paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.
 12. Maintain cleaning until Final Completion.
- D. Final Cleaning: In addition to cleaning during construction, prior to Substantial Completion provide the following:
1. Remove temporary protection and labels not required to remain.
 2. Clean finishes free of dust, stains, films and other foreign substances.
 3. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
 4. Vacuum clean carpeted and similar soft surfaces.
 5. Clean, damp mop, wax, and polish resilient and hard- surface floor as specified.
 6. Clean surfaces of equipment; remove excess lubrication.
 7. Clean plumbing fixtures, and food service equipment, to a sanitary condition.
 8. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.
 9. Clean light fixtures and lamps.
 10. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.

END OF SECTION

SECTION 01750

STARTING AND ADJUSTING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Procedures for starting of mechanical and electrical systems.

1.2 QUALITY CONTROL

- A. When specified in individual Sections, require manufacturer to provide authorized representative to be present at site to:
 - 1. Inspect, check, and approve equipment installation prior to start-up.
 - 2. Supervise placing equipment in operation.
 - 3. Provide a written report that equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting lines or anchor bolts, and has been satisfactorily operated under full load conditions.

1.3 SUBMITTALS

- A. Submit preliminary schedule listing times and dates for start-up of each item of equipment in sequence 2 weeks prior to proposed dates.
- B. Submit manufacturer's representative reports within one week after start-up, listing satisfactory startup dates.

1.4 PROJECT CONDITIONS

- A. Building enclosure is complete and weathertight.
- B. Excess packing and shipping bolts are removed.
- C. Interdependent systems have been checked and are operational.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that Project conditions comply with requirements.
- B. Verify that status of Work meets requirements for starting of equipment and systems.

3.2 PREPARATION

- A. Coordinate sequence for start-up of various items of equipment, including Owner-provided equipment.
- B. Notify Owner's Construction Manager 7 days prior to start-up of each item of equipment.
- C. Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.
- D. Verify that each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions which may cause damage.
- E. Verify control systems are fully operational in automatic mode.
- F. Verify that tests, meter readings, and specific electrical characteristics agree with those specified by electrical equipment manufacturer.

- G. Verify wiring to motors and controls required by mechanical work for operational smoke and fire protection demonstrations is complete.
- H. Verify wiring and support systems for equipment installed under separate contracts is complete and checked.
- I. Bearings: Inspect for cleanliness; clean and remove foreign matter. Verify alignment; take corrective measures.
- J. Drives: Inspect for tension on belt drives, adjustment of variable pitch sheaves and drives, alignment, proper equipment speed, and cleanliness. Take corrective action.
- K. Motors: Verify that motor amperage agrees with nameplate value. Inspect for conditions which produce excessive current flow and which exist due to equipment malfunction. Take corrective action.

3.3 STARTING SYSTEMS

- A. Execute start-up under supervision of responsible Contractor personnel.
- B. Place equipment in operation in proper sequence.

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Administrative provisions for Substantial Completion and for final acceptance.

1.2 DEFINITIONS

- A. Substantial Completion: The time in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

1.3 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. Complete items in following paragraphs before requesting Certification of Substantial Completion, either for entire Work or for portions of Work.
- B. Conduct inspection to substantiate basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or non-conforming work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
- C. Submit statement showing accounting of changes to Contract Sum.
- D. Advise Owner's Construction Manager of pending insurance change-over requirements at final payment.
- E. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
- F. Submit project record documents in compliance with Section 01780, maintenance manuals, negatives of construction photographs, and other similar final record data.
- G. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
- H. Make final change-over of locks eliminating construction masterkey system and transmit keys directly to Owner. Advise Owner of change-over in security provisions.
- I. Comply with requirements of Section 01500 for restoring permanent systems operated prior to Substantial Completion.
- J. Complete facility startup, testing, adjusting, and balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel.
- K. Discontinue or change over and remove temporary facilities and services from Project site, along with construction tools, mock-ups, and similar elements.
- L. Perform final cleaning in accordance with Section 01740.
- M. Touch-up and otherwise repair and restore marred exposed finishes.

1.4 SUBSTANTIAL COMPLETION

- A. When Contractor considers Work or designated portion of Work is substantially complete, submit written notice with list of items to be completed or corrected.
- B. Should Owner's Construction Manager inspection find Work is not substantially complete, he will promptly notify Contractor in writing, listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second written notice of substantial completion.
- D. When Owner's Construction Manager finds Work is substantially complete he will prepare a Certificate of Substantial Completion in accordance with provisions of General Conditions.

1.5 PREREQUISITES FOR FINAL COMPLETION

- A. Complete items in following paragraphs before requesting final acceptance and final payment. List known exceptions, if any, in request.
- B. When Contractor considers Work to be complete, submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been examined for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Work is completed and ready for final inspection.
- C. Submit final punch list indicating all items have been completed or corrected.
- D. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- E. Submit specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
- F. Submit updated accounting statement for final changes to Contract Sum.
- G. Submit consent of surety to final payment.
- H. Perform final cleaning for Contractor soiled areas in accordance with Section 01740.

1.6 FINAL COMPLETION

- A. When Contractor considers Work is complete, submit written certification
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - 4. Equipment and systems have been tested, adjusted and balanced, and are fully operational.
 - 5. Operation of systems has been demonstrated to Owner's personnel.
 - 6. Work is complete and ready for final inspection.
- B. Should Owner's Construction Manager's inspection find Work incomplete, he will promptly notify Contractor in writing listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second certification of final completion.
- D. When Owner's Construction Manager finds work is complete, Owner's Construction Manager will consider closeout submittals.

1.7 CLOSEOUT SUBMITTALS

- A. Evidence of Compliance with Requirements of Governing Authorities
 - 1. Certificate of Occupancy.
 - 2. Certificates of Inspection required for mechanical and electrical systems.
- B. Project Record Documents: Under provisions of Section 01780.
- C. Operation and Maintenance Data: Under provisions of Section 01780.
- D. Warranties and Bonds: Under provisions of Section 01780.
- E. Spare Parts and Maintenance Materials: Under provisions of Section 01780.
- F. Keys and Keying Schedule: Under provisions of Section 08710.
- G. Evidence of Payment and Release of Liens: In accordance with Conditions of the Contract.**
- H. Consent of Surety to Final Payment.
- I. Certificates of Insurance for Products and Completed Operations: In accordance with Supplementary Conditions.

1.8 STATEMENT OF ADJUSTMENT OF ACCOUNTS

- A. Submit final statement reflecting adjustments to Contract Sum indicating
 - 1. Original Contract Sum.
 - 2. Previous change orders.
 - 3. Changes under allowances.
 - 4. Changes under unit prices.
 - 5. Deductions for uncorrected work.

6. Penalties and bonuses.
 7. Deductions for liquidated damages.
 8. Deductions for reinspection fees.
 9. Other adjustments to Contract Sum.
 10. Total Contract Sum as adjusted.
 11. Previous payments.
 12. Sum remaining due.
- B. Owner's Construction Manager will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by change orders.

1.9 APPLICATION FOR FINAL PAYMENT

- A. Submit application for final payment in accordance with provisions of Conditions of the Contract and Section 01290.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

Forms referenced in this Section available in TGI Friday's Construction Handbook:

Certificate of Substantial Completion, TGIF Form

Contractor's Affidavit of Final Release of Liens, TGIF Form

Subcontractor's Mechanic's and Materialman's Affidavit of Final Release of Liens, TGIF Form

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Maintenance of Record Documents and Samples.
 - 2. Submittal of Record Documents and Samples.
 - 3. Format and content of operation and maintenance manuals.
 - 4. Instruction of Owner's personnel.
 - 5. Preparation and submittal of warranties and bonds.
 - 6. Spare parts, overages, and maintenance materials.
 - 7. Schedule of submittals.

1.2 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3 PROJECT RECORD DOCUMENTS

- A. Maintenance of Documents and Samples:
 - 1. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
 - a. Contract Drawings.
 - b. Specifications.
 - c. Addenda.
 - d. Change Orders and other modifications to the Contract.
 - e. Reviewed shop drawings, product data, and samples.
 - f. Field test records.
 - g. Inspection certificates.
 - h. Manufacturer's certificates.
 - 2. Store Record Documents and samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
 - 3. Label and file Record Documents and samples in accordance with Section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
 - 4. Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.
 - 5. Keep Record Documents and samples available for inspection by Owner's Construction Manager.
- B. Recording:
 - 1. Record information on a set of printed opaque drawings, and in a copy of a Project Manual.
 - 2. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.
 - 3. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
 - 4. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:
 - a. Measured depths of elements of foundation in relation to finish first floor datum.

- b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - d. Field changes of dimension and detail.
 - e. Changes made by Modifications.
 - f. Details not on original Contract Drawings.
 - g. References to related shop drawings and Modifications.
5. Specifications: Legibly mark each item to record actual construction, including:
- a. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
 - b. Changes made by Addenda and Modifications.
6. Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other documents required by individual Specifications sections.

1.4 OPERATION AND MAINTENANCE MANUALS

A. Format:

- 1. Prepare data in the form of an instructional manual.
- 2. Binders: Commercial quality, 8-1/2 by 11-inch three-ring binders with hardback, cleanable, plastic covers; 3-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- 3. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project, identify subject matter of contents.
- 4. Arrange content by systems, under section numbers and sequence of Table of Contents of this Project Manual.
- 5. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- 6. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- 7. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

B. Contents, Each Volume

- 1. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- 2. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- 3. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- 4. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- 5. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01450.
- 6. Warranties and Bonds: Bind in copy of each.

C. Manual for Materials and Finishes:

- 1. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.
- 2. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

3. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
 4. Additional Requirements: As Specified in individual Specifications sections.
 5. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
- D. Manual for Equipment and Systems:
1. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 2. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
 3. Include as-installed color coded wiring diagrams.
 4. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 5. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 6. Provide servicing and lubrication schedule, and list of lubricants required.
 7. Include manufacturer's printed operation and maintenance instructions.
 8. Include sequence of operation by controls manufacturer.
 9. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 10. Provide as-installed control diagrams by controls manufacturer.
 11. Provide Contractor's coordination drawings, with as- installed color coded piping diagrams.
 12. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 13. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 14. Include test and balancing reports as specified in individual specification sections.
 15. Additional Requirements: As specified in individual Specifications sections.
 16. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
- E. Instruction of Owner Personnel:
1. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, perform instructions for other seasons within 6 months.
 2. Refer to Section 01820.
- F. Submittals:
1. Submit 2 copies of preliminary draft or proposed formats and outlines of contents before start of Work. Owner's Construction Manager will review draft and return one copy with comments.
 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.
 3. Submit 2 copies of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Owner's Construction Manager comments, and Engineer's comments where applicable. Revise content of documents as required prior to final submittal.
 4. Submit 2 copies of revised volumes of data in final form within 10 days after final inspection.

1.5 WARRANTIES AND BONDS

A. Form

1. Bind in commercial quality 8-1/2 by 11 inch three-ring binders, with hardback, cleanable, plastic covers.
2. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor; and name of responsible principal.
3. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
4. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

B. Preparation

1. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
2. Verify that documents are in proper form, contain full information, and are notarized.
3. Co-execute submittals when required.
4. Retain warranties and bonds until time specified for submittal.

C. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

1.6 SPARE PARTS, OVERAGES, AND MAINTENANCE MATERIALS

A. Products Required:

1. Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual sections to be provided to Owner, in addition to that required for completion of Work.
2. Products: Identical to those installed in the Work. Include quantities in original purchase from manufacturer to avoid variations in manufacture.

B. Storage, Maintenance:

1. Store products with products to be installed in the Work, under provisions of Section 01600.
2. When adequate, secure storage facilities are available at site, capable of maintaining conditions required for storage and not required for Contract work or storage, or for Owner's needs, spare products may be stored in available space.
3. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

C. Delivery:

1. Coordinate with Owner: Deliver and unload spare products to Owner at Project site and obtain receipt prior to final payment.
2. For portions of Project accepted and occupied by Owner prior to Substantial Completion, deliver a proportional part of spare products to Owner; obtain receipt.

1.7 SUBMITTALS

- A. At Contract closeout, deliver Record Documents including samples, Operation and Maintenance Manuals, and Warranties and Bonds under provisions of Section 01770.

- B. Transmit with cover letter in duplicate, listing:
1. Date.
 2. Project title and number.
 3. Contractor's name, address, and telephone number.
 4. Number and title of each Record Document.
 5. Signature of Contractor or authorized representative.

PART 2 PRODUCTS and PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01820

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Procedures for demonstration of equipment operation and instruction of Owner's personnel.

1.2 QUALITY ASSURANCE

- A. When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstrations and instructions have been completed.
- B. Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.3 SUBMITTALS

- A. Submit preliminary schedule for Owner's approval, listing times and dates for demonstration of each item of equipment and each system, 2 weeks prior to proposed dates.
- B. Submit reports within one week after completion of demonstrations, that demonstrations and instructions have been satisfactorily completed. Give time and date of each demonstration, with a list of persons present.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify equipment has been inspected and put into operation in accordance with Section 01750; testing, adjusting, and balancing has been performed in accordance with Division 15 and 16, and equipment and systems are fully operational.
- B. Have copies of completed operation and maintenance manuals at hand for use in demonstrations and instructions.

3.2 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of equipment and systems to Owner's personnel 2 weeks prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within 6 months.
- B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

3.3 TIME ALLOCATED FOR INSTRUCTIONS

- A. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Clear site of plant life and grass.
 - 2. Remove root system of trees and shrubs.
 - 3. Remove surface debris.
 - 4. Remove paving, curbs, gutters.
 - 5. Topsoil excavation.

1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable building code for disposal of debris.
- B. Coordinate clearing Work with utility companies.
- C. Conform with applicable portions of O.S.H.A., including 1926.604.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Herbicide:
 - 1. Acceptable Product: Round-up by Monsanto.
- B. Substitutions: Submit in accordance with Section 01600.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified.
- B. Locate and identify utilities intended to remain.

3.2 PROTECTION

- A. Protect plant growth and features remaining as final landscaping. Flag as required to properly identify items to remain.
- B. Protect bench marks and existing work from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.
- D. Protect remaining utilities from damage.

3.3 CLEARING

- A. Dilute and apply herbicide in accordance with manufacturer's recommendations.
- B. Clear areas required for access to site and execution of Work.
- C. Remove trees and shrubs within marked areas. Grub out stumps, roots, and surface rock. Use only hand methods for grubbing inside drip line of trees indicated to remain.
- D. Clear undergrowth and deadwood without disturbing subsoil.
- E. Burning debris on site is not permitted.
- F. Remove debris, rock, and extracted plant life from site.

3.4 CUTTING CURBS AND GUTTERS

- A. Make new openings in curbs and gutters neat, as close as possible to profiles indicated and only to extent necessary for new work.

- B. At concrete, paving, and other materials where edges of cuts remain exposed in the completed work, make cuts using power-sawing equipment. Do not overcut at corners of cut openings.
- C. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Stockpile in area designated on site to depth not exceeding 8 feet. Protect from erosion. Remove from site excess topsoil not being reused.
- C. Do not excavate wet topsoil.

3.6 REMOVAL

- A. Remove debris from site. Leave site in clean condition ready for earthwork.

END OF SECTION

SECTION 02240

DEWATERING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes:
 - 1. Maintaining excavations free from water.

1.2 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Certifications:
 - 1. Signed and sealed by Professional Engineer specializing in this type of design and registered in the jurisdiction where project is located certifying that dewatering operations as designed and installed are in compliance with requirements of Contract Documents and applicable codes.
 - 2. Engineer's Site Visits: Schedule adequate visits to site during operations to verify that installed system meets specified requirements.
- C. Submit proposed materials and methods of installation, maintenance and removal of dewatering operations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Contractor's option as approved by Construction Manager.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Methods of Dewatering Contractor selected and designed including pumping and erosion control, damming, diverting, channeling, absorbing, establishing sedimentation ponds, and other methods selected to keep excavations dry. Control discharge into waterways. Prevent sediment from entering storm drains.
- B. Dewatering:
 - 1. Required from commencement of excavation through completion of backfilling.
 - 2. Removal of water from excavations including ground water, water from such sources as springs, seepage, leakage, perched water and surface water from such sources as rain, snow, run-off, streets, gutters, hydrants, accident spillage and liquid mud, from whatever source.
 - 3. Water and Its Removal: Unclassified excavation, sole responsibility of Contractor without additional cost to Owner.
 - 4. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
- C. Lower water table around building sufficiently to prevent "quick" condition in soil strata below building foundation. If "quick" condition destroys bearing capacity of soil strata, lower foundations and other building elements as needed and as directed by Geotechnical Engineer to obtain suitable soil bearing strata, at no additional cost to Owner.
- D. Contractor is solely responsible for performance of dewatering methods and devices. Correction of settlement and damage to persons and property due to settlement is the sole responsibility of Contractor.
- E. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

- F. Pumps: Maintain in continuous operating condition with additional stand by equipment in case of malfunction or increased water conditions.
- G. Periodically monitor level of water table outside of sheeting line.
- H. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas in accordance with applicable codes.
- I. Do not use trench excavations as temporary drainage ditches.

END OF SECTION

SECTION 02260

EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and bracing.
 - 3. Removal of shoring and bracing, as required.

1.2 SYSTEM DESCRIPTION

- A. Types of shoring and bracing systems include, but are not limited to, the following:
 - 1. Steel H-section (soldier) piles.
 - 2. Timber lagging.
 - 3. Steel sheet piles.

1.3 SUBMITTALS

- A. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Engineer Qualifications: Professional engineer legally authorized to practice the jurisdiction where project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.
- B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.
 - 1. Submit name of engaged consultant and qualifying technical experience.
- C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

- A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
- C. During excavation, re-survey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Construction Manager if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piles: ASTM A 328.
- D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

PART 3 EXECUTION

3.1 SHORING

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Construction Manager.
- C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
- D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace, as acceptable to Construction Manager, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION

SECTION 02362

TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Soil treatment below slabs-on-grade and at foundation perimeter for subterranean insects.

1.2 QUALITY ASSURANCE

- A. Applicator: Company specializing in soil treatment for termite control with 5 years documented experience.
- B. Materials: Provide certification that toxicants conform to specified requirements.
- C. Material Packaging: Manufacturer's labels and seals identifying content.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable requirements of authorities having jurisdiction for application licensing and authority to use toxicant chemicals.

1.4 SUBMITTALS

- A. Submit product data and manufacturer's installation instruction under provisions of Section 01330.
- B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01780.
- B. Accurately record moisture content of soil before treatment, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.6 WARRANTY

- A. Provide 5 year warranty for material and installation under provisions of Section 01780.
- B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites, and repairs to building or building contents so caused.
- C. Inspect work annually and report in writing to Owner.
- D. Owner reserves right to renew warranty for an additional 5 years after the initial 5 year period.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Toxicant Chemical: Water based emulsion, uniform composition, synthetic dye to permit visual identification of treated soil, of the following chemical element and concentrations
 - 1. Chloropyrifos: Dursban TC as manufactured by Dow Chemical, 1% solution.
 - 2. Permethrin: "Dagnet" by FMC or Torpedo" by ICI Americas, 0.5 percent in water emulsion.
- B. Substitutions: Submit in accordance with Section 01600.

2.2 MIX DILUTION

- A. Dilute toxicant chemical as recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION/PREPARATION

- A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.
- B. Beginning of application means acceptance of soil conditions.
- C. Notify Construction Manager at least 12 hours prior to beginning work.

3.2 APPLICATION

- A. Apply toxicant no more than 12 hours prior to installation of vapor barrier under slab-on-grade or finish grading outside foundation walls.
- B. Apply toxicant in accordance with manufacturer's instructions.
- C. Apply extra treatment to structure penetrations, pipe, ducts, expansion joints and other soil penetrations.
- D. Apply as a coarse spray to ensure uniform distribution.
- E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. Retreat disturbed treated soil.
- F. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations. To insure penetration, do not apply soil treatment to excessively wet soils or during inclement weather.
- G. Post signs in the areas of application, warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

3.3 RE-TREATMENT

- A. If inspection identifies the presence of termites, retreat soil and retest.
- B. Use same toxicant as for original treatment.

END OF SECTION

SECTION 02485

SPREAD AND CONTINUOUS FOOTINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Excavation and installation of spread and continuous footings as described herein and as shown on the Drawings.

1.2 QUALITY ASSURANCE

- A. Installation Tolerances:
 - 1. Maximum lateral variation off of centerlines: 2 inches.
 - 2. Plan Dimensions: Plus 3 inches, minus 1/2 inch.
 - 3. Thickness: Not smaller than scheduled sizes.
 - 4. Top of Footing Elevation: Plus 0 inches, minus 3 inches.

1.3 SCHEDULING/SEQUENCING

- A. Coordinate Work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.
- B. Schedule footing excavations such that reinforcing and concrete can be placed immediately after excavations are completed and inspected.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Formwork: Refer to Section 03100.
- B. Reinforcement: Refer to Section 03200.
- C. Concrete: Refer to Section 03300.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Spread and continuous footings: Extend to and penetrate bearing materials shown on Drawings.
- B. Exposed subgrade soils: Examined in the field by a geotechnical engineer of the testing laboratory to verify the strength and bearing capacity.
- C. Excavations and footings:
 - 1. Size and shape as shown on the Drawings.
 - 2. Bottom of each excavation: Level, undisturbed, free of water, caving material or any other foreign substance.

3.2 FABRICATION AND PLACING OF REINFORCING

- A. Steel reinforcing mats: Fabricated in rigid fashion to permit expeditious placement into excavation with minimum time delay.
- B. Accurately place reinforcement in excavations, maintaining specified coverage. Secure to prevent displacement during concreting.

3.3 FIELD QUALITY CONTROL

- A. Testing Laboratory services: In accordance with Section 01450.
- B. Inspect each concrete wall and column footing excavation to determine that proper bearing stratum is obtained and utilized for bearing and that excavations are properly clean and dry before placing concrete.
- C. Furnish complete footing log showing location, elevation of top of bearing stratum, footing size and depth, condition of material, excavation properly clean and dry before placing concrete, reinforcement in compliance with Contract Documents and any and all observed irregularities, deficiencies or deviations from Contract Documents.

3.4 INSPECTION

- A. Schedule footing excavation such that the concrete can be placed immediately after inspection.

3.5 PLACING OF CONCRETE:

- A. Place concrete so as to prevent segregation. Do not allow concrete to free fall over 5'-0"; provide tremie, chutes or other means of conveyance when drop exceeds this amount.
- B. Place concrete as soon as practical after the excavation has been completed. If concrete is not to be placed within 8 hours, place 3 inch thick lean concrete "working mat" over bearing surface of exposed subgrade soils within 4 hours after excavation has been completed. Do not extend "working mat" above the bottom elevation of the spread or continuous footing.

END OF SECTION

SECTION 02511

DISINFECTION OF WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Disinfection of potable water distribution and transmission system.
 - 2. Testing and reporting results.

1.2 SUBMITTALS FOR INFORMATION

- A. Submit in accordance with Section 01330.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Certificate: Certify that cleanliness of water distribution system meets or exceeds [specified] requirements.

1.3 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01780.
- B. Disinfection Report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- C. Bacteriological Report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water conforms, or fails to conform, to bacterial standards of local jurisdiction.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651.
- B. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum 3 years experience.
- C. Testing Firm: Company specializing in examining potable water systems, certified by the State in which the project is located.
- D. Submit bacteriologist's signature and authority associated with testing.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code or regulation for performing the work of this Section.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of water system.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, or AWWA B301, Liquid Chlorine.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 EXECUTION

- A. Provide and attach required equipment to perform the work of this Section.
- B. Introduce treatment into piping system.
- C. Maintain disinfectant in system for 24 hours.
- D. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water. Monitor system for 2 days and if water tests do not meet standards, repeat disinfection process.
- E. Replace permanent system devices removed for disinfection.
- F. Pressure test system. Repair leaks and re-test.

3.3 FIELD QUALITY CONTROL

- A. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 02530

SANITARY SEWERAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Sanitary sewerage drainage piping, fittings, accessories and bedding.
 - 2. Connection of building sanitary drainage system to municipal sewers.
 - 3. Cleanout access.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.3 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01780.
- B. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.
- B. Conform to Colerain Township requirements.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements and elevations are as indicated.

1.6 COORDINATION

- A. Coordinate work under provisions of Section 01310.
- B. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

- A. Cast Iron Soil Pipe: ANSI/ASTM A 74, Extra Heavy type, inside nominal diameter as noted in drawings.
- B. Cast Iron Pipe Joint Device: ASTM C 564, rubber gasket joint devices.
- C. Plastic Pipe: ANSI/ASTM D 2751, SDR 35 (SDR 36 if buried more than 10 feet below grade), Acrylonitrile-Butadiene-Styrene (ABS) material; bell and spigot style solvent sealed joint end.

2.2 PIPE ACCESSORIES

- A. Pipe Joints: Refer to Drawings.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- C. Trace Wire: Magnetic detectable conductor, [clear] [brightly colored] plastic covering, imprinted with "Sewer Service" in large letters.

2.3 CLEANOUTS

- A. Lid and Frame: Refer to Drawings.
- B. Shaft Construction and [Concentric] [Eccentric] Cone Top Section: Refer to Drawings.
- C. Base Pad: Cast-in-place concrete of type specified in Section 03300, leveled top surface to receive concrete shaft sections, sleeved to receive sanitary sewer pipe sections.
- D. Conform to Colerain Township standard details.

2.4 BEDDING MATERIALS

- A. Bedding: As specified in Section 02300.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on [layout] drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with course aggregate.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02300 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, in accordance with Section 02300.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM D 2321 and manufacturer's instructions. Seal joints watertight.
- B. Install pipe on minimum 12 inch deep bed of Type A aggregate.
- C. Begin installation at downstream discharge connection point and make connection where indicated on Drawings.
- D. Lay pipe to slope gradients noted on [layout] drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to 95 percent, per ASTM D 698.
- F. Refer to Section 02300 for trenching requirements. Do not displace or damage pipe when compacting.
- G. Connect to municipal sewer system.

3.5 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.6 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01450.
- B. Request inspection prior to and immediately after placing bedding.
- C. Compaction testing will be performed in accordance with ANSI/ASTM D 698.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

- E. Conduct video camera test in accordance with requirements on all pipe 12 inches and greater in diameter.

3.7 PROTECTION

- A. Protect finished installation under provisions of Section 01500.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02765

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Pavement markings including parking space designations, [directional arrows,] [painted handicapped symbols and access aisles at designated spaces], and [fire lane markings] as required by authorities having jurisdiction.

1.2 QUALITY ASSURANCE

- A. Installer: Having a minimum of 2 years experience in the layout and striping of parking lots.
- B. Job Conditions: Do not apply marking paint when weather is foggy or rainy, or ambient or pavement temperatures are below 40 degrees F., nor when such conditions are anticipated during 8 hours after application.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions in accordance with Section 01330.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Traffic Marking Paint:
 - 1. Type: Solvent borne alkyd resin; durable and weather-resistant; high solids; fast drying; VOC compliant; meeting requirements of Federal Paint Specifications TT-P-115F and TT-P-85E.
 - 2. Application Thickness per Coat: 15 mils wet (7 mils dry).
 - 3. Application Rate per Coat: 300 to 320 linear feet of 4 inches wide line per gallon.
 - 4. Colors:
 - a. White: Parking stall striping, directional emblems, restricted parking zone striping, disabled accessibility paths.
 - b. Blue with White Copy: Disabled parking emblems.
 - c. Red with White Copy: Fire lanes.
 - 5. Acceptable Products:
 - a. S275 Traffic Paint Alkyd 4900 Series by ICI Dulux.
- B. Traffic Marking Paint – Fast Dry
 - 1. Type: Waterborne acrylic resin; durable and weather-resistant; high solids; super fast drying; VOC compliant; meeting requirements of Federal Paint Specifications TT-P-1952B.
 - 2. Application Thickness per Coat: 15 mils wet (7 mils dry).
 - 3. Application Rate per Coat: 300 to 320 linear feet of 4 inches wide line per gallon.
 - 4. Colors:
 - a. White: Parking stall striping, directional emblems, restricted parking zone striping, disabled accessibility paths.
 - b. Blue with White Copy: Disabled parking emblems.
 - c. Red with White Copy: Fire lanes.
 - 5. Acceptable Products:

- a. S274 Traffic Paint Fast Dry Acrylic 4810 Series by ICI Dulux.
- C. Substitutions: Submit in accordance with Section 01600.

2.2 APPLICATION EQUIPMENT

- A. Pressurized, self-contained paint machine capable of applying a straight line from 2 to 6 inch wide, with consistent coverage.

PART 3 EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Locate markings as indicated on Drawings. Provide qualified technician to supervise equipment and application of markings. Lay out markings using guide lines, templates and forms.
- B. Thoroughly clean pavement surfaces free of dirt, sand, gravel, oil and other foreign materials.
- C. Allow paving to cure before painting as required by manufacturer of traffic paint.

3.2 APPLICATION

- A. Apply in accordance with manufacturer's written instructions.
- B. Apply 2 coats to portland cement concrete paving and asphaltic concrete paving with protective seal coat.
- C. Restrict traffic on pavement until stripping if fully cured.

END OF SECTION

SECTION 02810

IRRIGATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Pipe and fittings.
 - 2. Sprinkler heads.
 - 3. Control system and connection to electrical supply.
 - 4. Trenching, installation of system and connection to water source; testing, and backfilling.
 - 5. Provision of electric and water meter and connection to service source. Provide separate dedicated water meter at service vault.

1.2 QUALITY ASSURANCE

- A. Substitutions
 - 1. Procedure: Submit the following in compliance with Section 01600.
 - a. Sample of each proposed substitute sprinkler head.
 - b. Manufacturer's data showing specification of each sprinkler, discharge rates (GPM), minimum allowable operating pressure at sprinkler, maximum allowable spacing and distance of throw.
 - c. Detailed pressure loss computations of proposed substitute sprinkler if proposed sprinklers differ from those specified.
 - d. If proposed substitute requires a change in head and piping layout as designed, submit detailed drawings showing design changed and proposed layout, sealed by a licensed irrigator.
 - 2. Approval: Approval of proposed substitute will not relieve responsibility for providing a system that will operate according to intent of originally designed system.
 - 3. Testing: Perform required testing under observation of Construction Manager. Give 24 hours notice that such tests are to be conducted.

1.3 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's specifications and technical literature for each product proposed for use in accordance with Section 01330.
- B. Project Record Documents
 - 1. Comply with requirements of Project Record Document, Section 01780.
 - 2. Locate by written dimension, routing of mainline piping, remote control valves and quick coupling valves/hydrants.
 - 3. When work is complete, transpose changes to sepia mylars.
- C. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, components, plant and landscaping features, site structures, schedule of fittings to be used.

1.4 COORDINATION

- A. Coordinate installation of sprinkler system with work of other trades.
- B. Coordinate to ensure that irrigation sleeving and electrical power source is in place.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01780.

- B. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
- C. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

1.6 REGULATORY REQUIREMENTS

- A. Conform to City of Bridgeport Plumbing code for piping and component requirements.
- B. Provide certificate of compliance from authorities having jurisdiction of products in system.

1.7 DEFINITIONS

- A. Sprinkler Mains: Sprinkler mains are those portions of piping from water source to operating valves. These portions of piping, being closed sections, are subject to surges. Hydrant lines and quick coupling valves are considered parts of sprinkler mains.
- B. Lateral Piping: Lateral piping are those portions of piping from operating valves to sprinkler heads. These portions of piping are not subject to surges, being "open end" portions of the sprinkler system.

1.8 EXTRA STOCK

- A. Provide the following extra stock items under provisions of Section 01780.
 - 1. Two sprinkler heads of each type and size.
 - 2. Two valve keys for manual valves.
 - 3. Two keys for valve markers.
 - 4. Two wrenches for each type head core and for removing and installing each type head.

1.9 WARRANTY

- A. Provide system warranty, including cleaning and adjustment of heads, raising and lowering of shrub heads to compensate for shrub growth, for one year after acceptance.
- B. Limit guarantee to repair and replacement of defective materials or workmanship, including repair of backfill settlement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from on of the following:
 - 1. Buckner, Inc., Fresno, CA.
 - 2. Hunter Industries, Inc., San Marcos, CA.
 - 3. Rainbird Sprinkler Manufacturing Corp., Glendora, CA.
 - 4. The Toro Company, Riverside, CA.
 - 5. Watts Regulator Co., N. Andover, MA.
 - 6. Weather-Matic Div., Telsco Industries, Dallas, TX.
 - 7. Wilkins Operation/Zurn Industries, Paso Robles, CA.
- B. Substitutions: Submit in accordance with Section 01600.

2.2 MATERIALS - GENERAL

- A. Polyvinyl Chloride Pipe (PVC): PVC pipe manufactured in accordance with standards noted herein.
 - 1. Marking and Identification: Continuously and permanently marked with the following information:
 - a. Class 200 SDR 21 number.
 - b. ASTM D 2241 standard number.
 - c. NSF (National Sanitation Foundation) seal.
 - 2. PVC Pipe Fitting: ASTM D 2464 and D 2466, of the same materials as PVC pipe specified and compatible with PVC pipe provided.

- B. Solvent Cement: ASTM D 2564 for PVC pipe and fittings.
- C. Copper Tubing: Seamless, type 'M' hard drawn, ASTM B 88.
- D. Copper Piping: Hard, straight lengths of domestic manufacture only, ASTM B 88, Type 'L'. No copper tube of foreign extrusion, or so-called irrigation tubing (thin wall) allowed.
- E. Copper Pipe Fittings: Cast brass or wrought copper, sweat-solder type.
- F. Wire: 14 gage, single copper strand minimum. Type UF with 1/64 inches insulation. Underwriters Laboratory (UL) approved for direct underground burial when used in a National Electric Code Class II Circuit (30 volts AC or less).
- G. Flexible PVC Risers (Nipples): Virgin PVC material, complying with ASTM D 2287, tested at 200 psi static pressure for 2 hours and having a quick burst rating of 400 psi minimum.
 - 1. Acceptable Product: Excaliber type.
- H. Swing Joints: O-ring seal type
 - 1. Acceptable Product: Lasco.

2.3 ACCEPTABLE PRODUCTS

ITEM	MANUFACT.	MODEL NO.
Small Turf Head	Toro	5702-4P with MPR nozzle
	Rainbird	1804 with MPR nozzle
Shrub Area Head	Toro	5702-12P with MPR nozzle
	Rainbird	1812 with MPR nozzle
Medium Turf Head	Toro	300 Stream Rotor
	Hunter	PGM-04
	Hunter	PGP
Large Turf Head	Toro	2001
	Hunter	I-25 Plus
	Hunter	I-40
	Rainbird	Falcon F4
Remote Control Valves	Irritrol	100 P Century Series
	Rainbird	PEB
Control System	Rainbird	
Quick Coupler Valves	Buckner	1 inch Doubl Lug 25000

Backflow Preventer	Wilkins	Double Check
	Watts	Double Check
Master Valve	Irritrol	RCV 100 Century Series
Flow Switch/Sensor		
Electric Solenoid valves	Rainbird	PEB
Valve Box (Plastic)	Rainbird	12 by 18 inch
Valve Box (Concrete)	Rainbird	18 by 24 inch

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect areas and conditions under which irrigation sprinkler system is to be installed.
- B. Verify location of existing utilities and that they are ready for use.
- C. Notify Construction Manager in writing of conditions detrimental to proper and timely completion of work.
- D. Do not proceed until conditions are satisfactory.

3.2 PREPARATION

- A. Piping layout indicated is diagrammatic only. Layout and stake locations of system components. Route piping to avoid plants and structures. Verify full and complete coverage.
- B. Protect landscaping and other features remaining as final work.
- C. Coordinate work which is embedded in concrete or masonry and routed under paved areas according to underground irrigation sleeves.
- D. Provide timely delivery and installation at job site.

3.3 TRENCHING

- A. Trench for sprinkler system in accordance with Section 02300 and to provide proper grades and slopes to drain points. Provide minimum of 18 inch coverage over piping on pressure side of control valves and 12 inches on non-pressure side.
- B. Keep trenches free of debris, material, or obstructions that may damage pipe.
- C. Leave trench bottoms smooth so pipe will lay flat.
- D. Make trenches wide enough to allow 6 inches between parallel lines.

3.4 INSTALLATION

- A. General
 1. Perform work only in the presence of a licensed irrigator.
 2. Design Pressure: This system has been designed to operate with an minimum static inlet water pressure of 60 psi at the point of connection. Take a pressure reading prior to beginning construction. If the pressure reading is less than above, notify Construction Manager.
 3. Do not install system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage, area dimensions, or static water pressure exist that might not have been considered in the engineering. Bring obstructions or differences to the attention of the Construction Manager. In the event this notifications is not performed, assume full responsibility for any revision necessary.

4. Staking: Prior to installation, place a stake where each sprinkler is to be located. Receive approval of Construction Manager before proceeding.
 5. Piping Layout: Piping layout is diagrammatic. Route piping around trees and shrubs in such a manner to avoid damage to plantings. Do not dig within balls of newly planted trees and shrubs. Hand excavate whenever possible to avoid cutting of roots greater than 1 inch diameter, during construction.
 6. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
- B. Pipe Installations
1. Sprinkler Mains: Install in minimum 4 inch wide trenches with a minimum 18 inches cover.
 2. Lateral Piping: Install in minimum 4 inch wide trenches deep enough to allow for installation of sprinkler heads and valves, but in no case with less than 12 inches cover.
 3. Provide firm, uniform bearing in trenches for entire length of each pipe to prevent uneven settlement. Wedging or blocking of pipe is not permitted. Remove foreign matter and dirt from inside of pipes before welding, and keep inside of piping clear during and after layout of pipes.
 4. Provide for thermal movement.
 5. Backfill: Hand-tamp and water-jet to prevent settling. Hand rake trenches and adjoining areas to leave grade in a good or better condition than before installation. Backfill trench and compact as specified in Section 02300. Protect piping from displacement.
- C. PVC Pipe and Fittings Assembly
1. Solvent: Use solvent and procedures recommended by manufacturer to make solvent-welded joints. Thoroughly clean pipe and fittings of dirt, dust and moisture before applying solvent.
 2. PVC to Metal Connections: Work metal connections first. Use a non-hardening pipe dope on threaded PVC to metal joints. Use only light wrench pressure.
 - a. Acceptable Product: Permatex No. 2.
 3. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.
- D. Copper Pipe and Fittings Assembly
1. Clean pipe and fittings thoroughly and buff connections with sand paper to remove residue from pipe.
 2. Flux pipe and fitting and solder connection using 50- 50 soft solid core solder.
- E. Electrical Valves
1. Provide valves in accordance with materials list and size according to Drawings.
 2. Provide valves in a level position in accordance with manufacturer's specifications.
 3. Provide plastic or concrete valve box as noted on the Drawings, centered over valve, flush with finish grade. Provide valve box extensions as required.
- F. Sprinklers
1. General: Provide in accordance with materials list, with nozzling in accordance with Drawings. Revise nozzle degree and trajectory if wind conditions affect coverage. Set pop-up heads flush with finish grade.
 2. Shrub Heads: Provide spray heads on copper pipe risers of high pop sprinklers attached to lateral piping with flexible, Schedule 80 PVC nipples, sufficiently high to water over shrubs and plants when they have reached their ultimate growth, or as otherwise directed by Construction Manager. Firmly tamp soil around copper riser.
- G. Wiring
1. Provide wire from automatic sprinkler controls to valves. No conduit required for U.L. wire, except under pavement, unless otherwise noted on Drawings.
 2. Make wire connections with waterproof connectors according to manufacturer's recommendations, and only in approved valve boxes.
 3. Provide wire from controller to each electric valve. Provide a common neutral wire from controller to valves served by a particular controller.

4. Install control wiring. Provide 10 inch expansion coil at each valve to which controls are connected, and at 100 foot intervals. Bury wire beside pipe. Mark valves with neoprene valve markers containing locking device. Set valve markers in 160 psi PVC pipe risers extending from top of valve to finish grade.
- H. Automatic Sprinkler Controllers
1. Provide and install per manufacturer's recommendations.
 2. Locate as shown on Drawings with approval of Construction Manager.
 3. Complete controller connection to power supply in PVC conduit in accordance with local electrical codes with watertight fittings.
 4. Provide lightning protection (ground rod and wire) to nearest available ground location.
- 3.5 TESTING
- A. Prior to backfilling, test mains for a period of 4 hours. If leaks or pressure drops occur, correct defect and repeat test.
- 3.6 FINAL ADJUSTMENT
- A. After installation is complete, make final adjustment of sprinkler system preparatory to Construction Manager's final inspection.
 - B. Completely flush system to remove debris from lines by removing nozzles from heads on ends of lines and operating system.
 - C. Adjust sprinklers for proper operation and proper alignment for direction of throw.
 - D. Adjust each section of spray heads for operating pressure and balance to other sections by use of flow adjustment on top of each valve.
 - E. Adjust nozzling for proper coverage. Prevailing wind conditions or slopes may indicate that arc of angle or trajectory of spray should be other than as shown on Drawings. Change nozzles to provide correct coverage.
- 3.7 CLEANUP
- A. Keep premises clean and neat.
 - B. Replace and/or repair plant material, structures, and installations by others, damaged by work of this section.
- 3.8 SYSTEM DEMONSTRATION
- A. Instruct Owner's personnel in operation and maintenance of system including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.
- 3.9 ACCEPTANCE
- A. Upon completion of the Work, request Final Acceptance by the Architect. Areas that are not acceptable at this time will continue under Contractor's maintenance until Final Acceptance is given by the Architect.

END OF SECTION

SECTION 02826

METAL FENCING AND GATES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Metal gates at service court.
 - 2. Metal Panel fence at service court.
 - 3. Metal railing at patio.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01330 requirements and include:
 - 1. Product data sheets and specifications.
 - 2. List of completed projects and references.

1.3 JOB CONDITIONS

- A. Visit site and determine conditions that will affect installation of gate.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B.
- C. Provide components in the following sizes unless indicate otherwise on the Drawings:
 - 1. Pickets: 3/4 inch square tubing.
 - 2. Rails (gate frame): 1-1/2 inch square tubing.
 - 3. Posts: 4 inch diameter extra-strength steel pipe.
 - 4. Gate Frame Fabric: 2 inch steel tubing.
 - 5. Patio Railing:
 - a. 1 inch x 2 inch tubing for vertical and horizontal members.
 - b. 1 inch square tubing for picket members.
- D. Gate and Fence panels: Refer to Section 07143
- E. Cane Bolts: 1/2 inch diameter steel rod.
- F. Collar for Post at Concrete: Blum #367.
- G. Hardware: Refer to Section 08710.
- H. Grout: Portland cement anchor cement, non-shrink, non-metallic; for exterior applications, minimum cured compressive strength of 8,000 psi at 28 days, meeting ASTM C 109.
 - 1. Acceptable Product: Super Por-Rok by Minwax Construction Products Division, Montvale, NJ.

2.2 FABRICATION

- A. Patio Railing (Furnished by Owner's "Owner Furnished Contractor Installed" millwork supplier):
 - 1. Assemble sections by welding, do not grind welds.
 - 2. Install a hinged gate latch at each pair of gates, having provision for a heavy duty padlock.
- B. Service Court Fence and Gate:
 - 1. Joining:

- a. Weld each upright and rail intersection.
- b. Weld each picket and rail intersection.

2.3 FINISH

- A. Factory prime and apply finish coat per Section 09965

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide concrete sleeves in cast-in-place concrete for receiving cane bolts. Coordinate receptacle size with cane bolts. Refer to Drawings.

3.2 INSTALLATION

- A. Install fencing, railing, and gates as indicated on Drawings and in accordance with manufacturer's instructions, straight, plumb, and level.
- B. Adjust gate for smooth operation.

END OF SECTION

SECTION 02848

PARKING BUMPERS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Precast concrete parking bumpers.

1.2 QUALITY ASSURANCE

- A. Job Conditions
 - 1. Verify that asphalt [concrete] paving and pavement marking is completed and ready for installation of wheel stops.
 - 2. Coordinate installation of concrete wheel stops with pavement marking layout.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's literature and installation instructions in accordance with Section 01330.
- B. Certificates: Submit manufacturer's certification that materials meet specification requirements.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE PARKING BUMPERS

- A. Qualities: Precast concrete parking bumpers reinforced, and having 2 pre-drilled pin holes and having 2 cast-in anchor pins.
 - 1. Concrete: Normal weight concrete, minimum 4000 psi 28-day compressive strength.
 - 2. Reinforcing: 2 continuous No. 3 deformed reinforcement bars.
 - 3. Size: 8-1/2 inch wide by 6 inch high by 72 inch length.
 - 4. Anchor Pins: 5/8 inch deformed bar, 2 for each wheel stop, extending a minimum of 3 inches below bottom of wheel stop.
- B. Standards
 - 1. Concrete: ASTM C 94.
 - 2. Reinforcing: ASTM A 615, Grade 40.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify layout of parking bumper locations with pavement marking layout.
- B. Thoroughly clean surfaces to receive parking bumper free of dirt, sand, oil, grease or other foreign matter.

3.2 INSTALLATION

- A. Install a precast parking bumper in each parking space indicated on drawings.
- B. Install with anchors in accordance with manufacturer's instructions.
- C. Leave parking bumper securely anchored and in proper alignment.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
 - 2. Openings for other affected work.
 - 3. Form accessories.
 - 4. Stripping forms.

1.2 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

- A. Section 04810 - Unit Masonry: Masonry accessories attached to formwork.
- B. Section 05500 - Metal Fabrications: Metal fabrications attached to formwork.
- C. Section 07620 - Sheet Metal Flashing and Trim: Flashing reglets attached to formwork.
- D. Division 15 - Mechanical Items and sleeves attached to formwork.
- E. Division 16 - Electrical Items and sleeves attached to formwork.

1.3 SYSTEM DESCRIPTION

- A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.4 QUALITY ASSURANCE

- A. Construct and erect concrete formwork in accordance with ACI 301, ACI 117, latest edition, and ACI 347.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable building code.

1.6 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01330.
- B. Indicate pertinent dimensions, materials, and arrangement of joints and ties.
- C. Prepare shop drawings under seal of professional engineer authorized to perform such work and registered in jurisdiction where project is located. Design and engineering of formwork and shoring, as well as its construction, is the responsibility of the contractor.
- D. Submit product data under provisions of Section 01330 for tape, gaskets, form inserts, sealer, release agent, ties, waterstops, construction joints, and joint fillers.
- E. Submit a diagram of proposed construction joints. Submittal will be reviewed with respect to aesthetic criteria and for general design conformance only.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials under provisions of Section 01600.
- B. Deliver materials in manufacturer's packaging with installation instructions.
- C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.8 COORDINATION

- A. Coordinate work under provisions of section 01310.
- B. Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation and coordination of their work.

- C. Coordinate this Section with other Sections of work that require attachment of components to formwork.
- D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.
- E. Verify plumbing, conduit, raceways, ducts, etc. are installed prior to concrete placement.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

- A. Plywood: Solid one side grade; sound, undamaged sheets with clean, true edges.
- B. Lumber: No. 2 or better grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS - MATERIALS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off metal of adjustable length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or affect bond of subsequent surface finish, or impair natural bonding or color characteristics of coating intended for use on concrete;
 - 1. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - a. The Burke Group, San Mateo, CA.
 - b. Safe-Slip by Chem-Masters, Madison, OH.
 - c. Debond by L & M Construction Chemicals, Inc., Omaha, NE.
 - d. Nox-Crete Form Coating by Nox-Crete, Inc., Omaha, NE..
 - e. Cast-Off, Sonneborn Building Products, Minneapolis, MN.
 - f. Symons Corp., Des Plaines, IL.
 - g. Duogard Form Release Agen by W.R. Meadows, Inc., Elgin, IL.
- C. Fillets for Chamfered Corners and other justifications: Wood strips, sizes and configurations as detailed.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.
- E. Shores:
 - 1. Patented shores of approved design and manufacture, or built-up on job of structural grade timbers.
 - 2. Of adequate strength and properly braced to safely support imposed loads.
- F. Form Sealer – Acceptable Products:
 - 1. Formfilm by W.R. Grace.
 - 2. Pre-Form by Nox-Crete Co.
 - 3. Substitutions: Submit in accordance with Section 01600.
- G. Waterstop: 1 inch by 3/4 inch size, comprised of butyl rubber and bentonite clay.
 - 1. Acceptable Products:
 - a. Volcay Waterstop-RX by American Colloid Co.
 - b. Superstop Waterstop by Tremco, Inc.
- H. Formed Construction Joints: Galvanized steel, tongue and groove type, knock-out holes spaced at 6 inches on center, with anchors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.2 EARTH FORMS

- A. Earth forms not permitted, [except for footings where soil is conducive and approval is received from authorities having jurisdiction and structural engineer.]
- B. If utilized, earth forms shall be neat cut with near vertical sides. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

3.3 ERECTION

- A. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.
- B. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.
- C. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.
- D. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- E. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- F. Provide chamfer strips on external corners of beams, and columns where they will be exposed to view after completion of construction.
- G. Do not displace or damage vapor barrier placed by Section 03300.
- H. Construct formwork to maintain tolerances in accordance with ACI 301.
- I. Construct form full depth of concrete to be placed.

3.4 APPLICATION OF FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- B. Do not apply form release agent where concrete surfaces are scheduled to receive [special finishes] [applied coverings] which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstop in single lengths where possible. Install where detailed and wherever water penetration through construction joints is anticipated. Make provisions to support and protect water stops during progress of the work.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- H. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

3.6 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Camber slabs and beams as indicated in Drawings and in accordance with ACI 301.

3.7 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork for concrete surfaces to be exposed to view. Do not patch formwork.
- C. Refer to Section 03300 for testing.

3.8 FORM REMOVAL

- A. Notify Construction Manager prior to removing formwork.
- B. Do not remove forms, shoring and bracing until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Pay for and have testing laboratory make additional test cylinders to confirm strength requirements as required for early form recovery. Presume concrete to have reached this strength when either of the following conditions are met:
 - 1. Method 1
 - a. Test cylinders, field cured along with concrete they represent, have reached strength required for removal of formwork.
 - b. Except for field curing and age at test, mold and test cylinders as specified in testing.
 - 2. Method 2
 - a. After concrete has cured for same length of time as age at test of laboratory-cured cylinders which reached specified strength.
 - b. Length of time concrete has been cured in structure shall be determined by cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of air in contact with concrete is above 50 degrees F and concrete has been damp or thoroughly sealed from evaporation and loss of moisture.
- C. Remove formwork progressively so no unbalanced loads are imposed on structure.
- D. Do not damage concrete surfaces during form removal.
- E. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
- F. When repair of surface defects or finishing is required at early age, remove forms as soon as concrete has hardened to resist damage from removal operation.
- G. Top forms on sloping surfaces of concrete may be removed as soon as concrete has attained sufficient stiffness to prevent sagging.
- H. Perform needed repairs or treatment required on sloping surfaces at once and follow with curing.
- I. Loosen wood forms for openings as soon as loosening can be accomplished without damage to concrete.
- J. Formwork for walls, sides of beams, and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations.
- K. When shores and other vertical supports are so arranged that nonload-carrying form facing material may be removed without loosening or disturbing shores and supports, form facing material may be removed at earlier age.
- L. For exposed concrete surfaces, do not reuse formwork when it has deteriorated to the point where usage will affect the finished concrete appearance. Do not patch formwork.
- M. Do not place wood forms which cannot be retrieved after concrete placement. Use steel forms.

3.9 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean-out ports.
- C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

3.10 FORM RE-USAGE

- A. Thoroughly clean surfaces of forms and remove nails before reuse. Do not reuse damaged or worn forms. Inspect forms and retighten rustications as required.
- B. Reuse of architectural forms is subject to Construction Manager's approval. Forms that are damaged, worn, or unsuitable for producing quality finishes, in the Construction Manager's opinion, shall be rejected.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Reinforcing steel bars, and welded steel wire fabric for cast-in-place concrete.
 - 2. Support chairs, bolsters, and spacers, for supporting reinforcement.

1.2 QUALITY ASSURANCE

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, Documents 63 and 65.
- B. Conform to ACI 301 and 318.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Division 1.
- B. Indicate sizes, spacing, locations and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, and supporting and spacing devices.
- C. If requested, submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis to the testing laboratory. Testing lab shall review this submittal for conformance with the construction documents.

1.4 DELIVERY AND STORAGE

- A. Stack reinforcing steel in tiers and mark so that each length, size, shape and location can be readily determined. Exercise care to maintain reinforcement free of dirt, mud, paint or rust.
- B. Store materials and accessories on dunnage and under protective sheeting.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Reinforcing Steel: ASTM A 615, grade billet-steel deformed bars, uncoated, 60 KSI yield grade; ASTM A 706, grade 40 weldable for bars welded to steel members.
- B. Welded Steel Wire Fabric: ANSI/ASTM A 185 plain type; in flat sheets; uncoated finish.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated or plastic tipped type; sized and shaped as required.

2.3 FABRICATION

- A. Fabricate in accordance with ACI SP-66, providing concrete cover specified in Section 03300.
- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.
- C. Weld reinforcing bars in accordance with ANSI/AWS D1.4.

- D. Provide sufficient lap of splicing of reinforcement, where required, to permit transfer of stress in accordance with requirements of this specification. Splice wall vertical reinforcement at location of horizontal construction joints.
- E. Unless otherwise noted on the drawings to be more, lap reinforcement 30 bar diameters at splices or have dowels of same bar section and spacing as the bars to be spliced.

PART 3 EXECUTION

3.1 PREPARATION

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.

3.2 PLACING

- A. Place reinforcement in accordance with CRSI "Placing Reinforcing Bars" and ACI 318, with provisions of ACI 318 governing.
- B. Move bars as necessary to avoid interference with other reinforcing steel, conduits, or embedded items.
- C. If bars are moved more than one bar diameter or enough to exceed tolerances, submit resulting arrangement of bars to Owner's Representative for review.
- D. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement. Place in accordance with approved shop drawings and CRSI recommendations. Do not heat, cut or bend bars without Owner's Representative's approval.
- E. Do not displace or damage vapor retarder required by Section 03300.
- F. Refer to Section 03300 for minimum coverage of concrete unless noted otherwise on the Drawings.
- G. Place reinforcement, at time of concrete placing, free of mud, oil, or other materials that adversely affect or reduce bond.
- H. Reinforcement with Rust, Mill Scale, or Both: Considered satisfactory, provided minimum dimensions, including height of deformation, and weight of hand-wire-brushed test specimen are not less than ASTM A 615 requirements.
- I. Support reinforcement and fasten together to prevent displacement by construction loads of placing concrete. Use No. 16 gage black annealed wire at joints and crosses to accurately position reinforcing in place.
- J. Over formwork, use metal or plastic bar chairs and spacers to support reinforcement.
- K. Where concrete surface will be exposed to weather in finished structure, use non-corrosive or corrosion protected accessories within 1/2 inch of concrete surface.
- L. Where successive mats or rolls of reinforcing fabric are continuous, overlap welded wire fabric so that overlap measured between outermost cross wires of each fabric sheet is not less than spacing of cross wires plus 2 inches, not less than 12 inches.
- M. Bars having splices not shown on shop drawings will be subject to rejection.
- N. Do not bend reinforcement after being embedded in hardened concrete.
- O. Do not allow bars to be in contact with dissimilar materials.

3.3 FIELD QUALITY CONTROL

- A. Refer to Section 03300 for testing.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Cast-in-place concrete.
 - 2. Floors and slabs on vapor retarder over fill.
 - 3. Equipment pads, thrust blocks, light pole bases.

1.2 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1
- B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, 304, 305, 306, 309, and 318.
- B. Obtain materials from same source throughout the Work.
- C. Batch Plant: Able to show a minimum of 5 years experience in batching concrete. If required, furnish a list of similar sized jobs or special condition jobs performed during the last 2 years.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable building code as noted on the drawings.

1.5 TESTS

- A. Testing, monitoring, and analysis of concrete will be performed under provisions of Division 1.
- B. Submit proposed mix design of each class of concrete, along with recent, maximum 60 day old test cylinder break reports which confirm that mix exceeds specified strengths, to appointed testing laboratory for review prior to commencement of work. Mix design methods shall be in accordance with ACI 318-99. Mixes will be reviewed and mix modifications made by testing laboratory only.
- C. Submit recent, maximum 60 days old, tests of cement and aggregates to ensure conformance with requirements stated herein.
- D. Provide free access to the work and cooperate fully with appointed testing laboratory.
- E. Test for air entrainment on concrete exposed to freeze-thaw cycle.

1.6 SUBMITTALS

- A. Submit product data and shop drawings for specified products under provisions of Division 1.
- B. Forward 2 copies of design mixes and cylinder break certifications for each type of concrete to Owner's Representative for review at least 10 days prior to need. Refer to specification section 1.5, B for submittal and review requirements.
- C. Submit manufacturers' instructions under provisions of Division 1.
- D. Submit shop drawings indicating control joints, expansion joints, construction joints and embed locations.

1.7 COORDINATION

- A. Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation of their work.
- B. Obtain anchor bolts and other miscellaneous steel items to be cast into concrete from material supplier.
- C. Coordinate size and location of mechanical equipment concrete pads with applicable trades.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials in accordance with the requirements of Division 1.
- B. Mix and deliver concrete to project ready-mixed in accordance with ASTM C 94.
- C. Schedule delivery so that continuity of any pour will not be interrupted for over 15 minutes.
- D. Place concrete on site within 90 minutes after proportioning materials at batch plant.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Normal - Type I; air entrained where exposed to the freeze-thaw cycle; gray color.
- B. Fine Aggregate: ASTM C 33 clean, hard, durable, natural sand free from silt, loam or clay.
- C. Coarse Aggregate: ASTM C 33, hard, durable, uncoated, crushed limestone or other approved aggregate.
- D. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C 260
 1. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - a. W.R. Grace.
 - b. Master Builders.
 - c. Sika.
- B. Chemical Admixtures: ASTM C 494, Type A - water reducing; Type D - water reducing and retarding; Type E - water reducing and accelerating. Add cement-dispersing agent to concrete in order to hold water-cement ratio to an absolute minimum and to maintain adequate workability. Depending upon weather conditions at time of placing, cement-dispersing agent may be supplemented by a set- retarding or set-accelerating agent to improve control of setting and, in the case of hot weather, to minimize surface checking. Introduce admixtures in quantities and according to methods recommended by manufacturers of materials approved for use. Introduce admixtures only after receiving written approval from testing laboratory and Structural Engineer.
 1. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - a. W. R. Grace.
 - b. Master Builders.
 - c. Sika.

2.3 ACCESSORIES

- A. Bonding Agent: Two component modified epoxy resin;
 1. Acceptable Products:
 - a. Eucopoxy by Euclid Chemical Co.
 - b. Sonoprep by ChemRex Inc./Sonneborn.
- B. Sheet Vapor Retarder:
 1. Type: Minimum 6 mil film meeting requirements of ASTM E 1745, Class A and B.
 2. Water Vapor Transmittance: Maximum 0.006 grams per square foot per hour.
 3. Tensile Strength: Minimum 54.2 pounds at 1139 percent strain/MD per ASTM D 638.
 4. Tear Resistance: 7.40 pounds per foot MD per ASTM D 1004.
 5. Acceptable Products:
 - a. Stego Wrap Vapor Barrier by Stego Industries, Ilc, San Juan Capistrano, CA.
 - b. Griffolyn T-85 by Reef Industries
 - c. Rufco D16WB by Raven Industries
 6. Accessories: Rubber based pressure sensitive adhesive polyethylene tape.
 - a. Acceptable Product: Stego Wrap Red Polyethylene Tape.

- C. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7,500 psi in 28 days
 - 1. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - a. Master Builders.
 - b. Euclid Chemical.
 - c. ChemRex Inc./Sonneborn.
 - 2. Standards:
 - a. Overall Product: CRD-C-621.
 - b. Compressive Strength: ASTM C109, 2 inch cubes.
 - c. Bleed Performance: CRD C-611.
 - d. Flow-Factor: ASTM C230.
- D. Joint Filler: Refer to Section 03100.
- E. Miscellaneous Structural Metals Associated with Structural Concrete:
 - 1. Structural steel pieces including miscellaneous structural metals placed in concrete exposed to weather, in permanent contact with soil, or accessible to salt intrusion: Hot dipped galvanized in accordance with ASTM A 123.
 - 2. Structural steel pieces embedded in concrete: Conform to ASTM A 36, unless noted otherwise on the Drawings.
 - 3. Welding of inserts, anchors and other steel pieces used in conjunction with structural concrete: Conform to AWS D1.1.
 - 4. Welding of reinforcing steel used in conjunction with structural concrete: Conform to AWS D1.4.
 - 5. Headed Stud Anchors: Conform to ASTM A 108, minimum tensile strength 60,000 psi.
 - 6. Concrete Expansion Anchors: Wedge-type anchors, meeting the requirements of Federal Specifications FF-S-325, Group II, Type 4, Class 1, plated in accordance with Federal Specification QQ-Z-325C, Type II, Class 3. Size and location as indicated on the Drawings.
- F. Cure and Seal Compound: shall comply with ASTM C309. For concrete floors not to receive other finishes, use Ashford Formula to cure, seal and harden concrete.

2.4 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C 94, Alternative No. 2, or ACI 304.
- B. Deliver concrete in accordance with ASTM C 94.
- C. Select proportions for normal weight concrete in accordance with ACI 301 Method 1. Mix not less than one minute after materials are in mixer.
- D. Do not transport or use concrete after the following time has expired from time of initial mixing:
 - 1. 90 minutes when ambient temperatures are below 80 degrees F.
 - 2. 75 minutes when ambient temperatures are between 80 and 90 degrees F.
 - 3. 60 minutes when ambient temperatures are over 90 degrees F. Verify supplier of transit-mixed concrete has a plant of sufficient capacity, and adequate transportation facilities to assure continuous delivery at required rate. Frequency of deliveries to project site shall be such as to provide for continuous concrete placement throughout any one pour.
- E. Use accelerating admixtures in cold weather and retarding admixtures in hot weather only when approved by Engineer and testing laboratory. Use of admixtures will not relax cold weather placement requirements.
- F. Add air entraining agent to concrete mix for concrete work exposed to exterior excluding grade beams.
- G. Use of calcium chloride, thiocyanates, and admixtures containing more than 0.05 percent chloride ions is strictly prohibited.
 - 1. Provide certification of maximum chloride ion content in admixtures with mix designs.
- H. Use of fly ash is acceptable in non-architecturally exposed concrete under requirements stated below. If used, fly ash shall not exceed 20% or the total cementitious material.
- I. Fly Ash: Conforming to ASTM C 618; carbon content maximum 3 percent by volume.

1. Provide certification attesting to carbon content and compliance with ASTM C 618.
- J. Refer to schedule at end of this section for required mixes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.
- B. Correct unsatisfactory work prior to placing concrete.
- C. Remove rubbish from formwork immediately prior to placing concrete.
- D. Remove ice and excess water from excavations and formwork.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.
- B. Install vapor retarder under interior slabs-on-fill and over sand leveling bed, if present. Lap joints minimum 12 inches and seal with special tape of same permeance as vapor retarder. Do not disturb or damage vapor retarder while placing concrete. Repair damaged vapor retarder.

3.3 PLACING CONCRETE

- A. Notify Owner's Representative and testing laboratory a minimum of 24 hours prior to commencement of concrete operations.
- B. Place concrete in accordance with ACI 301 and as specified below.
 1. Unless protection is provided, do not place concrete in rain, sleet, or snow.
 2. Maximum height of concrete free fall is 5 feet. Where longer drops are necessary, use a chute, tremie or other approved conveyance to assist the concrete into place without separation. Do not place directly into any excavations, including piers, where water is standing. If the place of deposit cannot be successfully pumped dry, place through a tremie with its outlet end near the bottom of the place of deposit.
 3. Regulate rate of placement so concrete remains plastic and flows into position.
 4. Deposit concrete continuously until panel or section is completed. Place as near as possible to its final location; do not rehandle.
 5. Place concrete in horizontal layers 18 inches maximum thickness. Exercise special care to prevent splashing the forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on the forms or reinforcement before the work proceeds. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the respective member or section, except allow concrete to settle 2 hours where walls or columns are to receive superimposed loads.
 6. Do not place concrete, under any circumstances, except in presence of testing laboratory.
 7. When placing concrete in masonry, exercise extreme care to prevent concrete from staining face of masonry.
 8. Size and design equipment for chuting, pumping, and pneumatically conveying concrete to provide a practically continuous flow of concrete at the delivery end without separation of the materials. Do not use gravity-flow or aluminum chutes or conveyors for transporting concrete horizontally. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit.
 9. Consolidation
 - a. Comply with requirements of ACI 309.
 - b. Use mechanical vibrating equipment for consolidation.
 - c. Do not use vibrators to transport concrete in forms.
 - d. Use vibrators with sufficient speed and amplitude to consolidate effectively.
 - e. Keep a spare vibrator on site during concrete pours.

- f. Thoroughly consolidate concrete and work around reinforcement, embedded items and into corners of forms. Thoroughly consolidate layers of concrete with previous layers.
- 10. Construction Joints: Unless otherwise shown on Drawings, construct each footing, pier, column, beam, wall and slab monolithically. Each will be considered as a single unit of work. Where construction joints are absolutely unavoidable, locate joints at or near third-points of spans where approved by Owner's Representative. Provide appropriate keys in construction joints, plumb and level, whether horizontal or vertical. Place construction joints in exposed concrete work at detailed joints or rustications as approved by Owner's Representative.
- 11. Expansion Joint Fillers: Place pre-molded expansion joint fillers at locations as detailed and whenever required to separate site paving from building slabs. Refer to Drawings for required joint dimensions.
- 12. Cold Weather Placement: Do not place concrete when temperature is below 40 degrees F unless cold weather concrete procedures are followed as specified in ACI 306. Calcium chloride shall not be used.
- 13. Hot Weather Placement: Exercise special care to prevent high temperature in fresh concrete during hot weather in accordance with ACI 305. Use water reducing set-retarding admixtures in such quantities as especially recommended by manufacturer to assure that concrete remains workable and lift lines will not be visible. Concrete having a temperature in excess of 90°F will not be permitted. Cooling of water and/or aggregates will be required if concrete temperatures rise above this limit. When necessary, arrangements for installation of wind breaks, shading, fog spraying, sprinkling, ponding, or wet covering of a light color shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.
- 14. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, thoroughly roughen and clean the surfaces of the latter of all foreign matter, scum, and laitance. Retighten forms and re-coat the surface of the previously deposited concrete with specified bonding agent per manufacturer's directions.
- C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- D. Unless noted otherwise on the Drawings, maintain concrete cover around reinforcing in accordance with ACI 318.
- E. Place concrete continuously between predetermined construction and control joints.
- F. Place floor slabs on fill in pattern indicated on Drawings.
- G. Saw cut control joints at an optimum time after finishing.
- H. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.
- I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Owner's Representative upon discovery.
- J. Maintain record of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.4 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed formed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- B. Curing Methods: Perform curing of formed concrete by moist curing, or by moisture-retaining cover curing, as herein specified.
- C. Provide moisture curing by one of the following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Use continuous water-fog spray.

3. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- D. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by moisture cover curing method.
- E. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces.

3.5 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- C. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.6 FINISHING OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- D. Pitch floors to drains 1/8 to 1/4 inch per foot nominal, unless otherwise shown on the drawings.

3.7 PATCHING CONCRETE SURFACES

- A. It is the intent of these Specifications to provide for concrete wall, beam, and soffit surfaces of such quality as to require a minimum of pointing.
- B. Methods of Patching Concrete: Reviewed with and approved by Owner's Representative prior to application.
- C. Exercise care in forming, mixing and placing of concrete to ensure reasonably uniform dense surfaces, free from blemishes, voids, or honeycombs.
- D. Repair and patch defective areas with cement mortar and bonding agent mixture immediately after removal of forms, when acceptable to Owner's Representative.
 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- E. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Owner's Representative. Surface defects, as such include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.
 1. Repair concealed formed surfaces where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.
 1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Owner's Representative.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- G. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- H. Perform structural repairs with prior approval of Owner's Representative for method and procedure, using specified epoxy adhesive and mortar.
- I. Repair methods not specified above may be used, subject to acceptance of Owner's Representative.

3.8 DEFECTIVE CONCRETE

- A. Modify or replace, at Owner's Representative's option, concrete not conforming to required levels and lines, details, elevations and appearance. Removal and replacement shall not impair the strength or appearance of the structure.
- B. Repair or replace concrete not properly placed or of the specified type.

3.9 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 1.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- C. Formwork, Reinforcing Steel and Inserts

1. Prior to each concrete pour, inspect formwork for tightness of joints, proper shoring and bracing, and location of rustications, in accordance with ACI 347.
 2. Prior to each concrete pour, inspect fabrication and bending of bars, bar sizes, spacing, placement and tying in accordance with ACI 315.
 3. Prior to each concrete pour, inspect positioning of steel inserts and assemblies, sizes, and spacing, and test fusion-welded anchors and sheer connectors.
- D. Cast-in-Place Concrete
1. Design Mixes
 - a. Concrete mixtures to be reviewed by testing laboratory.
 - b. At the beginning of the work, submit proposed concrete mixes for review by Owner's Representative and testing laboratory, including the sieve analysis of fine and coarse aggregate ASTM C 136, dry rodded weight of coarse aggregate, ASTM C 29, and the specific gravity (bulk saturated surface dry), of fine and coarse aggregates ASTM C 127 and C 128. Laboratory will review and make mix modification recommendations.
 - c. Do not mix concrete for placing in the work until after laboratory reports reflect that each proposed mix will develop the strength required.
 2. Test Cylinders: Make at least one test of each day's pouring or each 50 cubic yards, whichever comes first, on each different portion or section of the work. Mold and cure specimens in accordance with ASTM C 31, and test in accordance with ASTM C 39. Test cylinders shall be made and tested by the laboratory in accordance with ASTM C 172. Footings, walls, and floor systems constitute different sections. Each test shall consist of 5 specimens, 2 of which shall be broken at 7 days, 2 at 28 days and one held in reserve. Determine temperature and air content for each set of test cylinders in accordance with ASTM C 231.
 3. Field Quality Control
 - a. Determine slump for each strength test and whenever consistency of concrete appears to vary, in accordance with ASTM C 143.
 - b. Monitor addition of water to concrete and length of time concrete is allowed to remain in truck.
 - c. Certify delivery tickets indicating class of concrete, amount of water added during initial batching, and time initial batching occurred.
 - d. Monitor work being performed in accordance with ACI recommendations as a standard of quality.
 4. Source Quality Control: Periodically inspect and control concrete mixing and loading of transit mix trucks at batch plant at intervals as agreed to by Owner's Representative and laboratory personnel.

3.10 PROTECTION

- A. Protect finished work under provisions of Division 1.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain or running water and mechanical injury.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 03600

GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Non-shrink grout under structural steel base plates, steel anchoring devices, and other locations as detailed or required.

1.2 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Comply with the applicable building code.
 - 2. No shrinkage when tested in accordance with ASTM C 827.
- B. Job Conditions
 - 1. Follow ACI practices for storing, mixing, placing and curing concrete in hot or cold weather.
 - 2. Avoid mixing more grout than can be placed within 45 minutes.
 - 3. Avoid grout placement when temperatures are, or will be, below 40 degrees F within 24 hours.
 - 4. Rigidly bolt down plates, equipment, shims or leveling screws to prevent their movement during installation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Grout
 - 1. Non-metallic shrinkage-resistant grout, pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents.
 - a. Acceptable Products:
 - 1) Euco N.S. by Euclid Chemical Co.
 - 2) Crystex by L&M Construction Chemicals.
 - 3) Masterflow 713 by Master Builders.
 - 2. Standards:
 - a. Overall Product: CRD-C-621.
 - b. Compressive Strength: ASTM C109, 2 inch cubes.
 - c. Bleed Performance: CRD C-611.
 - d. Flow-Factor: ASTM C230.
- B. Minimum Cured Strength: 10,000 psi compressive strength at 28 days.
- C. Water: Potable.

2.2 MIXING

- A. Set up mixing adjacent to grouting area. Mix grout in accordance with manufacturer's printed instructions. Use the stiffest mix possible.
- B. Temperature: Avoid storing grout in extreme temperature areas, that is, maintain warm storage in cold weather and cool storage in hot weather. Avoid mixing and placing products in severe hot or cold temperatures.

PART 3 EXECUTION

3.1 FORMWORK

- A. Where required, build leakproof forms that are strong and securely anchored to withstand grout pressures.

3.2 SURFACE PREPARATION

- A. Clear surfaces of oil, grease, dirt and laitance down to sound concrete. Remove rust from underside of plates. Thoroughly clean bolt holes and foundation area to be grouted. Roughen with small chipping hammer for good bonding surface. Saturate surface with clean water for 24 hours. Remove all standing water prior to grouting. Grout bolt holes first. Provide air relief holes in base plate as required.
- B. Forms: Verify forms are strong and tight enough to prevent leaking. Slant form at 45 degree angle on placing side, 1/4 inch or more from bed plate base. Place grout directly in the sloped form to reduce air entrapment. Maintain full contact of grout with plate and foundation until it hardens.

3.3 PLACING

- A. Keep foundation, bed plate and grout above 40 degrees F for at least 24 hours after placement.
- B. Pack from one side only, using dams on other sides to pack against to avoid air pockets. Grout must fill the entire void and with constant contact to plate.
- C. Use rods, chains or tamping to compact grout and remove voids. Remove forms or cut back grout only after initial set.
- D. Curing: Cover all exposed grout with wet rags immediately after placing. After final set, apply curing compound.

3.4 CURING

- A. Cure grout for 3 days after placing by keeping wet and covering with curing paper or burlap bags.

3.5 TESTING

- A. For every 1/3 cubic yards of grout placed, test grout strength with a set of cubes as follows:
 - 1. Set of cubes: Three cubes to be tested at 7 days, and 3 cubes to be tested at 28 days.
 - 2. Make and test cubes in accordance with ASTM C 109, with the exception that the grout should be restrained from expansion by a top plate.

END OF SECTION

SECTION 04055

MASONRY MATERIALS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Mortar for masonry.
 - 2. Reinforcement, anchorages, and accessories.

1.2 SUBMITTALS

- A. Submit product data under provisions of Section 01330.
- B. Include design mix, indicate Proportion or Property method used, required environmental conditions, and admixture limitations.
- C. Test Reports:
 - 1. Submit test reports under provisions of Section 01450.
 - 2. Submit test reports on mortar indicating conformance to ASTM C 270 and C 780.
- D. Submit manufacturer's certificate under provisions of Section 01450 that products meet or exceed specified requirements.
- E. Submit manufacturer's installation instructions under provisions of Section 01330.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products under provisions of Section 01600.
- B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.5 QUALITY ASSURANCE

- A. Arrange routine testing of the mortars with a testing agency approved by the Owner. The cost of routine testing shall be borne by the Contractor. Provide reports directly to the Owner and the Contractor the same day of the test.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- C. MIX TESTS
 - 1. Test mortar in accordance with Section 01450.
 - 2. Testing of Mortar Mix: In accordance with ASTM C 780.
 - 3. Test mortar mix for compressive strength, air content, and slump.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C 150, Type I, gray and white color, non-staining.
- B. Mortar Aggregate: ASTM C 144, standard masonry type.
 - 1. For 1/4 inch or less joints: 100 percent passing No. 8 sieve and 95 percent passing No. 16 sieve.
- C. Hydrated Lime: ASTM C 207, Type S.

- D. Quicklime: ASTM C 5, non-hydraulic type; containing no air entrainment.
 - E. Water: Clean and potable.
 - F. Masonry Cement: ASTM C 91-78.
 - 1. Acceptable Products:
 - a. Gray Masonry Cement by Lehigh Hanson, Inc., 300 E. John Carpenter Freeway, Irving, TX 75062 (972) 653-5500.
 - b. i.pro Brixment by Essroc Italcementi Group.
 - 2. Color: Refer to Finish Schedule in drawings.
- 2.2 MORTAR MIXES
- A. Mortar for Non-load Bearing Walls and Partitions: ASTM C 270, Type N using the Property Method to achieve 750 psi strength.
 - B. Mortar for Double Wythe Walls: ASTM C 270, Type S using the Property Method to achieve 750 psi strength.
- 2.3 MORTAR MIXING
- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C 270 and C 780.
 - B. Provide uniformity of mix.
 - C. Do not use anti-freeze compounds to lower the freezing point of mortar.
 - D. If water is lost by evaporation, re-temper only within 2 hours of mixing.
 - E. Use mortar within 2 hours after mixing at temperatures of 80 degrees F, or 2-1/2 hours at temperatures under 50 degrees F.
- 2.4 MANUFACTURERS - REINFORCEMENT, ANCHORAGES, AND ACCESSORIES
- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Dur-O-Wal. By Hohmann & Barnard, Inc., Hauppauge, NY.
 - 2. Heckmann Building Products, Inc., Chicago, IL.
 - B. Substitutions: Submit in accordance with Section 01600.
- 2.5 REINFORCEMENT AND ANCHORAGES
- A. Corrugated Metal Ties: Not allowed.
 - B. Horizontal Joint Reinforcing:
 - 1. Type: Standard truss design, fabricated from ASTM A 82 cold-drawn steel wire.
 - 2. Side Rods: Two or more continuous 9 gage deformed side rods butt welded in same plane to continuous diagonal 9 gage plain cross rod at 16 inches on centers maximum.
 - 3. Size: Standard length 10 to 20 feet; side rods spaced approximately 2 inches less than width of partition or wall in which placed.
 - 4. Finish: Exterior walls; ASTM A 153, Class B-2, minimum 1.5 ounce per square foot zinc coating) hot-dip galvanized.
 - 5. Provide prefabricated tee and corner units.
 - 6. Acceptable product: Dur-O-Wal Truss by Hohmann & Barnard, Inc.
 - C. Adjustable Veneer Anchors:
 - 1. Type: Adjustable design, hot dipped galvanized, 14 gage steel anchor plate with 3/16 inch diameter double legged pintle tie.
 - 2. Size: Tie to extend to within 1 inch of outside face of masonry.
 - 3. Finish: ASTM A153, Class B-2, minimum 1.50 ounce per sq ft zinc coating.
 - 4. Fasteners: Self-drilling, self-tapping, No. 10 screw with cadmium or zinc coated finish; criteria to meet anchor manufacturer's requirements; length to suit Project conditions. Two fasteners minimum per plate.
 - 5. Acceptable Product: D/A 213, Dur-O-Wal.
 - D. [Adjustable Veneer Anchors for Seismic Conditions: Adjustable eye and pintle design, hot dipped galvanized, 14 gage steel anchor plate, nominal 6 inches long with 3-5/8 inches long eye opening designed to receive 3/16 inch diameter vee-shaped pintle tie with overlap.

1. Size: Tie to extend to within 1 inch of outside face of masonry.
 2. Clip: Rigid PVC extrusion with retaining ridges for snap-in of pintle wire and of reinforcing wire, with grooved base for embedding in mortar.
 3. Finish: ASTM A153, Class B-2, minimum 1.50 OZ/SQ FT zinc coating.
 4. Continuous Reinforcing Wire: 9 gage ASTM A 82 cold-drawn steel wire.
 5. Fasteners: Self-drilling, self-tapping, No. 10 screw with cadmium or zinc coated finish; criteria to meet anchor manufacturer's requirements; length to suit Project conditions. Two fasteners minimum per plate.
 6. Acceptable Product: DW 10HS with Byna-tie, Seismiclip, and continuous reinforcing wire, by Hohmann & Barnard.]
- E. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60, unless noted otherwise on structural drawings.
- F. Expansion Joint Fillers:
1. Type: Closed cell neoprene complying with ASTM D 1056, Class RE41.
 2. Compatible with sealant.
 3. Self-adhering on one side; 50 percent minimum compressibility.
 4. Size: Thickness to suit joint size; depth to allow sealant application.
 5. Locations: Vertical expansion joints, horizontal joints at head of masonry terminating below shelf angles, beams, or slabs; other locations as detailed.
 6. Acceptable Products: D/A 2010 and 2015 by Dur-O-Wal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Request inspection of spaces to be grouted.

3.2 PREPARATION

- A. Plug cleanout holes with block masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

3.3 INSTALLATION

- A. Install mortar to requirements of the specific masonry Sections.

3.4 FIELD QUALITY CONTROL

- A. Submit materials proposed for use and intended proportioning to testing laboratory for test batching of mortar. Make test cubes to verify compliance with specification requirements. During first day's masonry work, test mortar cubes, 4 total, will be made by testing laboratory, with one each broken at 7, 14, and 28 days, and the 4th held in reserve.
- B. Testing laboratory will perform mortar cube testing as masonry work continues on the project, with a minimum of 2 sets of test cubes each week, or corresponding to each 2000 square feet of wall surface laid, whichever occurs first. Perform mortar sampling and testing in accordance with ASTM C 109 and ASTM C 780 and grout sampling and testing per ASTM C 1019.
- C. Test the mortar for the water-soluble alkali content of the cement used in the mortar in accordance with ASTM C 114-77, or suitable certification furnished by the manufacturer of the cement, to establish that total water-soluble alkali content does not exceed 0.1 percent of the alkalies present.

END OF SECTION

SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Clay masonry units for veneer construction.

1.2 SUBMITTALS

- A. Submit product data under provisions of Section 01330.
- B. Submit product data for masonry units and fabricated wire reinforcement.
- C. Submit samples under provisions of Section 01330.
 - 1. Submit 4 samples of face brick units to illustrate color texture and extremes of color range.
- D. Submit manufacturer's certificate under provisions of Section 01450 that products meet or exceed specified requirements.

1.3 MOCKUP

- A. Provide mockup under provisions of Section 01450.
- B. Construct face brick to 4 by 6 foot panel size, including mortar, special shapes, bonding, joint work, reinforcement, grouting, mortar color, expansion and control joints and accessories specified.
- C. Obtain approval prior to proceeding with the work.
- D. Remove panel when directed by Construction Manager after completion of work.

1.4 QUALITY ASSURANCE

- A. Acceptable Manufacturer: Minimum 5 years experience manufacturing specified product.
- B. Installer: Minimum 5 years experience in similar types of work and be able to furnish a list of previous jobs and references if requested by Construction Manager.
- C. Expansion Joints: Provide expansion joints as shown on the Drawings or if not shown, install at frequency and in accordance with details as recommended by the B.I.A. Confirm locations and frequency with Construction Manager before beginning work.
- D. Furnish copies of brick tests that have been performed in accordance with ASTM C 67-78; particularly for Initial Rate of Absorption and Efflorescence.
- E. Welding: In accordance with "Standard Code for Arc and Gas Welding in Building Construction", AWS.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. In hot weather, above 99 degrees F with less than 50 percent relative humidity, protect masonry construction from direct exposure to sun and wind.
- B. Cold Weather Requirements: IMIAC - Recommended Practices and Specifications for Cold Weather Masonry Construction.

1.6 DELIVERY AND STORAGE

- A. Deliver and store materials in accordance with the requirements of Section 01600.
- B. Store mortar materials on dunnage in a dry place.
- C. During freezing weather, protect masonry units with tarpaulins or other suitable material.
- D. Protect reinforcement and accessories from elements.

- E. Store masonry units above ground on level platforms that allow air circulation under stacked units.
- F. Cover and protect masonry units against wetting prior to use.
- G. Handle units on pallets or flat bed barrows.
- H. Do not permit free discharge from conveyor units or transporting in mortar trays.

PART 2 PRODUCTS

2.1 BRICK MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Redland Brick.
- B. Substitutions: Under provisions of Section 01600.

2.2 BRICK UNITS

- A. Face Brick: ASTM C 216, Type FBS, Grade SW.
 - 1. Size, Color, and Texture: Refer to Finish Schedule in drawings.
- B. Special Shapes: Of same brick type as above, shaped to profile indicated including solids, 45 degree soldiers; surface texture on face and ends.

2.3 MODIFIED BITUMEN MASONRY FLASHING

- A. Acceptable Products:
 - 1. Norshield.
 - 2. Perm-A-Barrier Wall Seam Tape & Wall Flashing System by W.R. Grace & Co.
 - 3. Polygard JT-30.
 - 4. Wascoseal Type 20 by Wasco Products.
 - 5. Nervastral HD 20 by Rubber and Plastics Compound Co. Inc.
 - 6. BFG Vinyl Water Barrier by the B.F. Goodrich General Products Company.
- B. Substitutions: Submit in accordance with Section 01600.
- C. Material:
 - 1. Sheet Membrane: Rubberized asphaltic sheet laminated to a polypropylene film, 40 mil minimum total thickness, width as required for joints and flashing conditions.
 - 2. Primer: Rubber based solvent type recommended by membrane manufacturer.
 - 3. Mastic: Rubberized asphaltic type recommended by membrane manufacturer.
 - 4. Liquid Membrane: Two component elastomeric, mastic grade.

2.4 ACCESSORIES

- A. Control Joints: Preformed rubber material. Width slightly less than wall thickness to allow for sealant material.
- B. Joint Sealant: Refer to Section 07920.
- C. Building Paper: Asphalt saturated felt, No. 15 [30].
- D. Nailing Strips: Western softwood, preservative treated, sized to masonry joints.
- E. Weep Holes: Open head joints.
- F. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
 - 1. Acceptable Product: Mortar Net Weep Vents by Mortar Net USA, Ltd.
- G. Cleaner: Verify with masonry manufacturer that cleaner specified is acceptable.
 - 1. Acceptable Products subject to manufacturer's approval:
 - a. "Sure Klean" by Prosoco, Inc.
- H. Pea Gravel: 1/4 to 1/2 inch washed, rounded gravel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

- A. Supply metal anchors to Section 03300 for placement in concrete. Direct correct placement.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Establish lines, levels, and coursing. Protect from disturbance.
- D. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.
- E. Scaffolding:
 - 1. Provide, erect, maintain, move, and finally remove scaffolding and staging required for masonry installation.
 - 2. Construct and maintain scaffolding in compliance with applicable ordinances, laws, rules and regulations.
 - 3. Sufficiently substantial to support workmen and necessary materials and equipment.
 - 4. Provide adequate guard rails for protection of property, workmen, and passersby.
- F. Wet clay masonry units prior to laying if required to reduce excessive absorption of mortar moisture by the unit.

3.3 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry joints to uniform width of 3/8 inches. Make vertical and horizontal joints equal, of uniform thickness, tightly tucked.
- C. Lay clay brick running bond. Form concave mortar joints.

3.4 PLACING AND BONDING

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- D. Remove excess mortar on surface and in cavities.
- E. Perform job site saw cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- F. Isolate masonry partitions from vertical structural framing members with a control joint.

3.5 CONSTRUCTION TOLERANCES

- A. Unit masonry construction shall be within the following tolerances:
 - 1. Maximum variation from plumb in vertical lines and surfaces of columns, walls and arrises:
 - a. 1/4 inch in 10 feet.
 - b. 3/8 inch in a story, height not to exceed 20 feet.
 - 2. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:
 - a. 1/4 inch in any story or 20 feet maximum.
 - b. 1/2 inch in 40 feet or more.
 - 3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - a. 1/4 inch in any bay or 20 feet.
 - b. 1/2 inch in 40 feet or more.

4. Maximum variation from plan location of related portions of columns, walls and partitions:
 - a. 1/2 inch in any bay or 20 feet.
 - b. 3/4 inch in 40 feet or more.
5. Maximum variation in cross-section dimensions of columns and thicknesses of walls from dimensions shown on Drawings:
 - a. Minus 1/4 inch.
 - b. Plus 1/4 inch.

3.6 REINFORCEMENT AND ANCHORAGES

- A. Install horizontal joint reinforcement 16 inches on center typically and 8 inches at intersection of walls.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16 inches minimum each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.
- F. Verify that anchorages embedded in concrete and attached to structural steel members are properly placed.
- G. Attach wall ties to wall studs for veneer construction at maximum 16 inches on center vertically and 16 inches on center horizontally. Place at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings. Place at 8 inches on center at parapets.
- H. Reinforce joint corners and intersections with strap anchors 8 inches on center.
- I. [Embed seismic clip in mortar bed. Snap pintle tie and continuous reinforcing wire into seismic clip ridges. Locate and butt splice ends of continuous reinforcing wire in clips.]

3.7 MASONRY FLASHINGS

- A. Install using skilled workmen in accordance with manufacturer's printed instructions and recommendations.
- B. Prime substrate and adhere elastomeric flashing to sheathing backup on stud wall systems as work progresses. Allow flashing to drop a minimum of 8 inches before bedding into mortar joint of exterior veneer. Stop flashing at outside face of wall.
- C. Where reglets are detailed, slip flashing into reglet and secure in place per manufacturer's recommendations. Allow flashing to drop a minimum of 8 inches before bedding into mortar joint of exterior veneer. Stop flashing 1/2 inch from outside face of wall. Seal tightly to vapor barrier.
- D. Seal joints in flashing and joint treatment watertight with lap distance and method as recommended by manufacturer. Create end dams to channel water back to nearest weep hole.
- E. Steel Separation: Wrap steel members (including lintels) that are enclosed in masonry with No 15 felt. Securely tie with wire at 12 inches on center. Do not bond masonry to structural steel members.

3.8 LINTELS

- A. Install loose steel lintels as scheduled or shown.
- B. Install precast concrete lintels as scheduled.
- C. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or shown. Construct lintels using grout fill and reinforcing. Maintain minimum 8 inch bearing on each side of opening.
- D. Construct lintels using grout fill and reinforcing specified. Place two No. 4 reinforcing bars 1 inch from bottom web, for openings up to 42 inches wide. Place two No. 5 reinforcing bars in same location for openings up to 78 inches wide. Reinforce larger openings as detailed.
- E. Use reinforcing bars of one piece lengths only.

- F. Place and consolidate grout fill without disturbing reinforcing.
- G. Allow lintels to reach strength before removing temporary supports.
- H. Set steel lintels dry on felt paper. Leave space at end of lintels to expand. Seal, not mortar, joint in front of lintel in accordance with Section 07920.

3.9 WEEPS AND VENTS

- A. Install weep holes in veneer at 24 inches on center horizontally for clay masonry, above through-wall flashing, above shelf angles, and at bottom of walls.
- B. After placement of flashing, fill cavity to a depth of 6 inches with pea gravel.

3.10 CAVITY WALL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.
- B. Build inner wythe ahead of outer wythe to receive cavity insulation air or vapor barrier adhesive.

3.11 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcing across control joints.
- B. Install resilient control joint in continuous lengths. Solvent weld butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints in accordance with Section 07920 for sealant performance, but in no case larger than adjacent mortar joints in exposed face brick.
- D. Provide expansion joints where shown on the Drawings or as required or as recommended by referenced standards.

3.12 BUILT-IN WORK

- A. As work progresses, build-in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build-in items plumb and level.
- C. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build-in organic materials subject to deterioration.

3.13 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.14 DAMPPROOFING

- A. Refer to Section 07114 for sheet membrane dampproofing on outer face of inner wythe of cavity walls.

3.15 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with a non-acidic solution that will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners. Leave surfaces thoroughly clean and free of all mortar and other soiling.
- D. Use non-metallic tools in cleaning operations.
- E. Do not clean brick in direct sunlight when temperatures are over 90 degrees F.

3.16 PROTECTION

- A. Protect finished installation under provisions of Section 01500.

- B. Maintain protective boards at exposed external corners that may be damaged by construction activities.
- C. Provide protection without damaging completed work.
- D. At day's end, or stoppage of work, cover unfinished walls with a strong waterproof membrane that is securely anchored to prevent moisture infiltration.
- E. Keep expansion joint voids clear of mortar.

END OF SECTION

SECTION 04820

THIN BRICK

PART 1 GENERAL

1.1 SUMMARY

- A. Thin brick veneer.

1.2 REFERENCES

- A. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- B. ASTM C 270 – Standard Specification for Mortar for Unit Masonry.
- C. ASTM C 482 – Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste.
- D. ASTM C 1088 - Standard Specification for Thin Veneer Brick Units Made From Clay or Shale.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's catalog data, detail sheets, and printed installation instructions.
- C. Verification Samples: For each product, color, and texture selected, provide two full-size units representing actual color and texture of products to be installed.

1.4 SAMPLE PANELS

- A. Construct sample panel at location indicated or directed, and as follows:
 - 1. Size: 4 feet by 4 feet (1.2 m by 1.2 m).
 - 2. Include all unit types and sizes to be used, and mortar joint treatment.
- B. Obtain architect's acceptance of sample panel before beginning construction activities of this section.
- C. Do not remove sample panel until construction activities of this section have been accepted by architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products of this section on pallets, with individual faces protected; keep dry.
- B. Store units in protected area or under cover on level ground; keep dry. Do not double-stack pallets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Redland Brick, Inc., which is located at: 15718 Clear Spring Road, Williamsport, MD 21795; Tel: 800-366-2742;; Web: www.redlandbrick.com
- B. Substitutions: Not permitted.

2.2 MATERIALS

- A. Thin Brick: ASTM C 1088, Type TBS, tested in accordance with ASTM C 67, as manufactured by Redland Brick, Inc.
 - 1. Size: 3-5/8 inches (92.1 mm) high, 7-5/8 inches (193.7 mm) long, 5/8 inch (12.7 mm) thick.
 - 2. Texture: Machine Moulded.

3. Color: Refer to finish legend in drawings.
- B. Adhesive: ASTM C 270, polymer fortified mortar meeting ASTM C 482 shear bond strength.
 1. Manufacturer: Latricrete Masonry Veneer Mortar or equal
- C. Mortar:
 1. Manufacturer: Latricrete Masonry Pointing Mortar or equal.
 2. Color: Natural Grey
 3. Joint Size: 3/8"
 4. Joint Type: Concave

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect related conditions; do not start work in an area until adverse conditions in that area are corrected.

3.2 PREPARATION

- A. Test surfaces for straightness, levelness. Notify Architect where corrections are needed.

3.3 INSTALLATION

- A. Install thin brick in accordance with manufacturer's printed instructions.
- B. Cut units where required for fitting or for installation of built-in items, using power tools; do not install units having chipped or cracked edges on sight-exposed surfaces.
- C. Align base courses to follow accurate floor lines.
- D. Align faces plumb, level, and true, with uniform joint widths.
- E. Size and portion units for best appearance, with joints arranged neat and symmetrical, free of imperfections detracting from overall appearance.

3.4 FIELD QUALITY CONTROL

- A. Architect will observe appearance of installed units; installed masonry surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 feet (1.5 m) at 90 degrees normal to surface.

3.5 CLEANING

- A. Clean installed masonry surfaces in accordance with manufacturer's instructions; do not clean units with products not specified in manufacturer's instructions.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Labor, materials, services, and equipment required in conjunction with or incidental to the furnishing, fabrication, delivery, and erection of structural steel complete, including, but not limited to, the following
 - a. Structural steel columns, girders, beams, angles, rigid frames, trusses, shelf angles, angle frames for openings in floors and roofs, steel supports equipment, steel plates, miscellaneous deck support angles, shop welded shear studs, connections and component parts.
 - b. Qualification of welders.
 - c. Grouting under base plates.
 - d. Shop prime coat of paint and field touch-up painting.
 - e. Temporary construction bracing.
 - 2. The extent of structural steel work is shown on the drawings, including schedules, notes and details to show sizes and locations of members, typical connections and types of steel required.
 - 3. Include supplementary parts and members necessary to complete the structural steel work, regardless of whether such parts are definitely shown or specified, and furnish such bolts, gussets, plates, and other fasteners and accessories as may be required for proper assembly of items. Include miscellaneous deck support angles as required for proper support of metal floor deck around columns, gussets, openings, and obstructions.

1.2 QUALITY ASSURANCE

- A. Testing and Laboratory Services
 - 1. Testing laboratory services for quality control: Refer to Division 1.
- B. Codes and Standards: Comply with provisions of following, except as otherwise indicated
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges.
 - 2. AISC Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design, including commentary, June 1989.
 - 3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 - 4. AWS D1.1 "Structural Welding Code.
 - 5. Industrial Fasteners Institute "Handbook on Bolt, Nut, and Rivet Standards.
 - 6. Steel Structure Painting Council
 - a. Painting Manual, Volume 1, Good Painting Practice.
 - b. Painting Manual, Volume 2, Systems Specifications.
 - 7. Research Council on Riveted and Bolted Structural Joints: "Specifications for Structural Joints using ASTM A 325 or A490 Bolts.
- C. Design
 - 1. Connections: Design connections under direct supervision of a Professional Engineer registered in the jurisdiction where project is located, to resist forces shown on structural drawings and as required by building code. Indicate forces, in detail, on shop drawings. Design connections in accordance with requirements shown on drawings. Provide full penetration welds for moment connections to develop full

strength of beam. Use design values for high strength bearing type bolts with thread allowed across shear plane.

2. Substitutions:
 - a. Submit substitutions of sections or modifications of details, or both, and reasons with shop drawings for approval.
 - b. Clearly identify and note substitutions as such.
 - c. Coordinate approved substitutions, modifications, and necessary changes in related portions of work by fabricator and accomplish same at no additional cost to Owner.
 3. Responsibility for Errors: Fabricator is responsible for errors of detailing, fabrications, and for correct fitting of structural steel members.
 4. Templates: Furnished by Fabricator with instructions for setting of anchor bolts and bearing plates.
- D. Mill Inspection of Plates: Examine plates 5/8 inch and greater in thickness in mill by manufacturer with ultrasonic examination conforming to ASTM A 435, latest edition.
1. Steel Plates: Free of gross internal discontinuities such as ruptures or laminations.
 2. Submit mill test results with steel plates delivered for use on this project indicating compliance with this requirement.

1.3 QUALIFICATIONS

- A. Structural Steel Fabricator: Not less than 10 years experience in fabrication of structural steel for buildings.
- B. Structural Steel Erection: Not less than 5 years experience in erection of structural steel.
- C. Welders: Qualified to perform procedures and positions encountered per AWS certification standards.

1.4 SUBMITTALS

- A. Product Data: Submit producer's or manufacturer's Specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with Specifications, including specified standards.
 1. Structural steel, each type, including certified copies of mill reports covering chemical and physical properties.
 2. High strength bolts, each type, including nuts and washers.
 3. Structural steel primer paint.
 4. Shear studs.
- B. Shop Drawings
 1. Submit Shop Drawings including design calculations of registered professional engineer, and including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures, and diagrams showing sequence of erection. Do not use reproducibles of Contract Documents for shop drawings.
 2. Submit 1 set per transparency and blue line prints as required by Division 1 of each detailed Shop and Installation Drawing including design calculations for connections of structural steel. Design calculations will be retained for the Owner's Representative's file, and will not be returned approved. Owner's Representative's review shall cover member sizes, general locations, spacings, and details of design. Omission from shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though such Shop Drawings may have been returned and reviewed.
 3. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 4. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by other trades.
- C. Certificates and Reports
 1. Welders' Certificates: Submit under provisions of Division 1, certifying welders employed on the work, verifying AWS qualifications within the previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials in accordance with requirements of Division 1.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 JOB CONDITIONS

- A. Coordinate erection of structural steel with work of other trades.
- B. Do not install columns which have anchor bolts in concrete, until concrete members have attained their 28 day compressive strengths.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Steel
 - 1. Structural Steel Shapes, Plates, and Bars:
 - a. W shapes shall conform to ASTM A992.
 - b. All other steel shapes, bars and plates conform to ASTM A36.
 - 2. Structural Steel Tubing: ASTM A 500, Grade B, (46,000 psi yield).
 - 3. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- C. Bolts and Washers
 - 1. Anchor Rods and Erection Bolts: Conform to ASTM A 307 and to requirements for regular hexagon bolts and nuts of ANSI Standards B18.2.1 and B18.2.2 unless noted otherwise on drawings.
 - 2. High Strength Bolts for Connections: Conform to ASTM A 325 or A490.
 - a. Dimensions of Bolt Heads or Nuts: Conform to requirements for heavy hexagon nuts of ANSI Standard B18.2.2.
 - 3. Standard Washers: Flat and smooth, conforming to requirements of Type A in ANSI Standard B23.1.
 - a. Beveled Washers for `S` Shapes and Channels: Square or rectangular, taper in thickness, and be smooth.
 - b. Provide hardened steel washers for use with high strength bolts.
 - 4. At Contractor option, direct tension indicating washers for high strength bolts may be used on connections except anchor and erection bolts.
 - a. Acceptable Manufacturer Load Indicator Washers: Bethlehem Steel Corp.
 - 5. At the Contractor's option, tension control bolts may, be used in lieu of standard high strength bolts and load indicating washers.
 - a. Acceptable Manufacturer: LeJeune Bolt Company.
- D. Welding Electrodes: Conform to Specifications of the American Welding Society. Use E70 electrodes for ASTM A 36 Steel. For high-strength, low alloy steel, use electrodes, and filler metals equal in strength and compatible in appearance to parent metals being joined.
- E. Primer Paint: FS TT-P-31, red oxide, 3 mils DFT. For exterior exposures (all exterior exposures shall be treated as SSPC Zone 2A, provide primer compatible with paint system and topcoats specified in Division 9, and SSPC Specifications.

- F. Zinc-Coating: Provide on items exposed to elements and on masonry shelf angles, conforming to ASTM Specification A 123.
 - 1. Zinc-coating for Threaded Products: Conform to ASTM A 153, Class C.
 - 2. Zinc-coating for Sheet Steel: Conform to ASTM A 591.
- G. Cold Galvanizing Compound (for touch-up only):
 - 1. Acceptable Product: ZRC Cold Galvanizing Compound by ZRC Chemical Products Co., Quincy, MA.
- H. Grout: Refer to Section 03600 - Grouting.

2.2 FABRICATION

- A. Shop Fabrication and Assembly
 - 1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final Shop Drawings. Provide camber in structural members where indicated.
 - a. Specified Camber Tolerance (provide the following unless indicated otherwise on Drawings)
 - 1) Minus 0 to plus 1/2 inch for members up to 50 feet long.
 - 2) Additional 1/8 inch for each 10 feet of length over 50 feet long.
 - 2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
 - 4. Splicing of structural steel members is prohibited without prior approval of Owner's Representative. Any member having a splice not shown and detailed on approved Shop Drawings shall be rejected.
 - 5. Members in Compression Joints which Depend on Contact Bearing: Mill bearing surfaces to a common plane. Completely assemble members to be milled before milling.
 - 6. Plates: Free of gross internal discontinuities such as ruptures and delaminations.
- B. Connections: Weld or bolt shop connections, as indicated.
 - 1. Bolt field connections, except where welded connections or other connections are indicated. Provide specified threaded fasteners for principle bolted connections. Drill or punch holes for bolted constructions at right angles to member. The slope of surfaces under the bolt head and nut shall not exceed 1:20. Provide beveled washers where slopes exceed 1:20. Bolt holes shall have a diameter not greater than one-sixteenth (1/16) inch larger than the nominal bolt diameter. Do not flame cut holes or enlarge by burning.
 - 2. High strength bolted connections: Install in accordance with AISC "Specifications for Structural Joints using ASTM A 325 Bolts" (RCRBSJ).
 - 3. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp. Welds not specified shall be continuous fillet welds, using minimum fillet designed to develop the full strength of the membrane. No combination of bolts and welds shall be used for stress transmission at the same face of any connections.
 - 4. Clean areas to which studs are to be attached of rust, oil, grease, and paint. When the mill scale is sufficiently thick to cause difficulty in obtaining proper welds, remove by grinding or sand-blasting.
 - 5. For high-strength, low-alloy steels, follow welding procedures as recommended by steel producer for exposed and concealed connections.

6. Base plates: Hole sizes for anchor bolts may be oversized to facilitate erection as follows:
 - a. Bolts 3/4 inch to 1 inch diameter - 5/16 inch oversize
 - b. Bolts 1 inch to 2 inch diameter - 1/2 inch oversize
 - c. Bolts over 2 inch diameter - 1 inch oversize
 - d. Use oversize or plate washers under nut at all oversized holes in base plates. Washers must be large enough to cover the entire hole.
 - 1) Washer thickness: Minimum one-eighth of bolt diameter.
- C. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final Shop Drawings. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 FINISH

- A. General: Shop paint with one coat of specified primer structural steel, except those members or portions of members described below.
- B. Paint embedded steel which is partially exposed on exposed portions and initial 2 inches of embedded areas only.
- C. Do not paint members exposed to the elements. These are to be hot-dipped galvanized as specified herein.
- D. Do not paint surfaces which are to be welded.
- E. Do not paint surfaces which are to receive sprayed on fireproofing, or are encased in concrete.
- F. Surface Preparation: After inspection and before shipping, clean steel-work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 1. For standard interior protected uses: SP3 – Power Tool Cleaning.
 2. For exterior exposures and Architecturally Exposed Structural Steel: SP6 – Commercial Blast Cleaning.
 3. Repairing steel defects for both exterior exposures and for Architecturally Exposed Structural Steel: Weld spatter and other steel defects (e.g., scabs, burns, and slivers) that become visible after blast cleaning should be removed by sanding or grinding. All sharp edges or rough surfaces should be ground to a smooth contour (normally a 1/8 inch radius). Repaired areas should be restored to the original cleanliness and profile. This may be accomplished by spot air blast cleaning or vacuum blasting the damaged area or by use of profile producing power tools.
- G. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- H. Galvanize structural steel members to which will be exposed to the elements to ASTM A 123. Provide minimum of 1.25 ounces per square foot galvanized coating. Straighten steel after galvanizing to achieve specified tolerances.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

- A. Examine areas and conditions under which structural steel work is to be installed, and notify Owner's Representative of conditions detrimental to proper and timely completion of work.
- B. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices before erection proceeds.

3.3 ERECTION

- A. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.
- B. Employ registered Professional Engineer or land surveyor for accurate alignment and elevation of structural steel.
- C. Temporary Shoring and Bracing:
 - 1. Provide adequate shoring and bracing to safely withstand loads to which the structure may be subjected during the construction process, including wind loads, dead loads, construction, material, and equipment loads. Such bracing shall remain in place as long as required for safety.
 - 2. As the erection progresses, make permanent welded or bolted connections sufficiently to withstand erection stresses and maintain stability.
 - 3. Design of temporary shoring and bracing: Responsibility of the Contractor.
- D. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete the work.
- E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
- F. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge or base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Pack from one side only, with dams on other sides to pack against. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions. Grout under base plates immediately after erecting the member and before additional load is placed on the member. Refer to Section 03600 for additional information.
- G. Field Assembly:
 - 1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 2. Level and plumb individual members of structure within specified AISC tolerances.
 - 3. Erection tolerances: Individual pieces shall be erected so that deviation from plumb, level, and alignment shall not exceed 1 to 500.
 - 4. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for the difference between temperature at time of erection and mean temperature at which the structure will be when completed and in service.
 - 5. Splice members only where indicated and accepted on final shop drawings.
 - 6. Where parts cannot be assembled or fitted properly as a result of errors in fabrication or of deformation due to handling or transportation, report conditions immediately to the Owner's Representative along with proposed method of correction. Straightening of bends or warps shall be done by approved methods. Bent or damaged heat-treated parts will be rejected.
 - 7. Fasten splices in compression members after the abutting surfaces have been brought completely into contact.
- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces. On non-exposed welded construction, tighten erection bolts securely and leave in place or if removed, fill holes with plug welds.

- I. Bolted Connections
 - 1. Install high strength bolts in conformance with the "Specification for Structural Joints using ASTM A 325 or A 490 Bolts".
 - 2. Tighten ASTM A 307 bolts using a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench, bringing the plies into snug contact.
 - 3. For all bearing type bolted connections, bolts shall be installed to a snug tight fit with all plies in a joint in firm contact.
 - 4. Fit: Bolted parts solidly together when assembled. Ensure joint surfaces are free of burrs, dirt and other foreign material that would prevent solid seating of the parts.
 - 5. Provide a hardened washer under the bolts (nut or bolt head) tightened by calibrated wrench or by torque control turned in tightening.
 - 6. Place hardened washers over slotted holes in an outer ply. Use hardened beveled washers where the outer face of the bolted parts has a slope greater than 1:20 with respect to the bolt axis.
- J. Comply with AISC recommendations for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- K. Do not enlarge holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- L. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Owner's Representative. Finish gas-cut sections equal to a sheared appearance when permitted.
- M. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas with same materials as used for shop painting. Apply by brush or spray to provide a minimum dry film of thickness of 2.5 mils.

3.4 FIELD QUALITY CONTROL

- A. Fabrication of, erection of, and connections between, structural steel members, including welding and tension in high strength bolts, will be accomplished under and subject to the inspection and approval of an independent testing agency. The structural steel fabricator and erector shall afford full cooperation to the laboratory.
- B. Perform the following testing and inspection: (Prior to placement of steel deck)
 - 1. Check temporary bracing of steel frame.
 - 2. Check location and condition of anchor bolts.
 - 3. Check plumbness and tolerance of steel frame.
 - 4. Visually inspect common bolts.
 - 5. Inspection of high-strength bolting: All high-strength bolted connections shall be visually inspected to ensure that all plies of the connected elements have been brought into snug contact.
 - 6. Visually inspect field and shop welds.
 - 7. Ultrasonic or X-ray testing of full penetration welds.
 - 8. Re-inspect corrective measures required at expense of Contractor.
 - 9. Verify that no members are damaged.
 - 10. Certify that materials and installation are according to Contract Documents and industry standards.
- C. Gas Cutting: Do not use gas cutting torches for correcting fabrication errors in the structural framing. Cutting will be permitted only on secondary members as acceptable to the Structural Engineer. Finish gas-cut sections equal to a sheared appearance when gas finish cutting is permitted. Do not flame cut holes or enlarge holes by burning.
- D. Correction: The fabricator or erector shall correct deficiencies in structural steel work which inspection and test reports have indicated to be not in compliance with the specified requirements. Perform additional tests required to reconfirm non-compliance of the original work and to show compliance of corrected work.
- E. Welders employed during erection of structural steel must be certified for type of base materials and positions encountered. Perform certification testing at Contractor's expense.

3.5 PROTECTION

A. Protect installed work as required to ensure original integrity is not altered.

3.6 CLEAN-UP

A. Clean steel as work progresses to remove foreign matter.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Shop fabricated ferrous metal items.
 - 2. Aluminum framing.
 - 3. Refer to Schedule at end of this Section.

1.2 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish metal fabrications to be cast in concrete to Section 03300 – Cast-In-Place Concrete.
- B. Furnish metal fabrications to be embedded in masonry to Section 04810 - Unit Masonry Assemblies.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01330.
- B. Indicate quantities, locations, profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
- C. Include erection drawings, elevations, and details where applicable.
- D. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

1.4 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the jurisdiction where project is located.
- B. Welders' Certificates: Submit under provisions of Section 01450, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Drawings.

1.6 COORDINATION

- A. Coordinate and verify required access door sizes and locations with applicable trades.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Sections: ASTM A 36.
- B. Steel Tubing: ASTM A 500, Grade B.
- C. Steel Pipe: ASTM A 53, Grade B, Schedule 40.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- E. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1 (A1).
- F. Bolts, Nuts, and Washers: ASTM A 307, Grade A.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout:

1. Non-metallic shrinkage-resistant grout, pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents.
 - a. Acceptable Products:
 - 1) Euco N.S. by Euclid Chemical Co.
 - 2) Crystex by L&M Construction Chemicals.
 - 3) Masterflow 713 by Master Builders.
 2. Standards:
 - a. Overall Product: CRD-C-621.
 - b. Compressive Strength: ASTM C109, 2 inch cubes.
 - c. Bleed Performance: CRD C-611.
 - d. Flow-Factor: ASTM C230.
- I. Minimum Cured Strength: 10,000 psi compressive strength at 28 days.
- J. Water: Potable.

2.2 ALUMINUM

- A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- E. Refer to Drawings for sizes and shapes.

2.3 FABRICATION

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections, for delivery to site.
- D. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
- F. Make exposed joints butt tight, flush, and hairline.
- G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.
- H. Form all aluminum sections true to detail, free from defects impairing appearance, strength or durability. Use aluminum or stainless steel screws, bolts, and fasteners where used with aluminum. Use fasteners conforming to requirements of A.I.S.C. where used with carbon steel.

2.4 SHELF ANGLES

- A. Provide steel shelf angles of sizes indicated for attachment to building framing.
- B. Furnish wedge-type concrete inserts with fasteners for attachment of shelf angles to concrete.
- C. Miter outside and inside corners. Do not weld joints.
- D. Finish: Galvanized.

2.5 STAINLESS STEEL ANGLES

- A. Provide stainless steel angles sized as shown on Drawings.

2.6 STEEL LINTELS

- A. Provide at wall opening and recesses.
- B. Weld multiple loose lintels to form a single unit.
- C. Provide a minimum of 8 inches of bearing at ends unless noted otherwise.
- D. Finish: Galvanized.

2.7 PIPE BOLLARDS

- A. Type: Standard steel pipe.
- B. Fill with standard weight concrete; set in concrete foundations. Ensure concrete at top of pipe is uniformly rounded and smooth.
- C. Finish: Galvanized.

2.8 FRAMING AND SUPPORTS

- A. Provide framing to support countertops, wall-mounted units, wall-mounted casework, and ceiling-hung items.
- B. Finish: Universal primer.

2.9 FINISH

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.
- C. Prime paint interior steel items scheduled with two coats of primer.
- D. Galvanize exterior steel items and those touching exterior masonry walls to minimum 2.0 ounces per square foot zinc coating in accordance with ASTM A 386. Finish coating surface to be smooth, without irregularities, drip marks, or other roughness, ready for priming with minimal preparation required.

2.10 UNIVERSAL PRIMER

- A. Manufacturer's standard, lead free primer, capable of providing sound foundation for field applied top coats despite prolonged exposure.
- B. Standard: FS TT-P-645.
- C. Maximum Allowable Dry Time: 4 hours to touch; 24 hours to re-coat.
- D. Compatible with finish paint system specified in 09900 or 09965, as scheduled or noted.
- E. Acceptable Products (subject to compatibility with finish coating):
 - 1. Tnemec, Chem Prime 37H-77, Tnemec, Kansas City, MO.
 - 2. Valspar 13-Y-5, Valspar, Baltimore, MD.
 - 3. Carboline Multi-Bond 150, by Carboline Company, St. Louis, MO.

2.11 ZINC-RICH PRIMER

- A. Inorganic, zinc-rich, capable of providing sound foundation for field applied top coats despite prolonged exposure, cathodic protection and corrosion resistance.
 - 1. Pigment Content: Minimum 80 percent zinc in dry film by weight.
 - 2. Compatible with finish paint system specified in Section 09910 [09965].
- B. Acceptable Products:
 - 1. Valspar MZ-7 (13-F-12) by Ameron, Baltimore, MD.
 - 2. Tnemec N90-392 Tneme-Zinc, Tnemec Co., Kansas City, MO.

2.12 GALVANIZING

- A. Provide hot-dip galvanized coating in accordance with:
 - 1. ASTM A 153 - Iron and Steel Hardware.
 - 2. ASTM A 123 - Rolled, pressed and forged steel shapes, plates, bars and strips 1/8 inch thick and heavier.
- B. Galvanizing Repair Paint:
 - 1. Standard: MIL-P-21035 or SSPC-Paint-20.
 - 2. Acceptable Products:
 - a. Valspar M-Z-2 (13-F-2), Valspar, Baltimore, MD.
 - b. Tnemec 90-93, Tnemec Co., Kansas, MO.

2.13 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

- C. Bright, Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.14 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M12 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Electrolytically deposited color Anodic Finish: AA-M12 C22 A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

- A. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip site primed steel items to bare metal where site welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects. Adequately reinforce and anchor work in place. Form exterior joints to exclude water.
- B. Perform field welding in accordance with AWS D1.1, D1.2 or D1.3 depending on substrate involved.
- C. After installation, touch-up field welds, scratched or damaged surfaces with primer.
- D. Install stock manufactured items in accordance with manufacturer's directions.

3.4 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch.

3.5 DISSIMILAR MATERIALS

- A. Where aluminum surfaces will contact steel, other incompatible metals, masonry, stone or concrete, keep the aluminum surfaces from direct contact with such dissimilar material by painting the compatible metal with prime coat of zinc chromate primer followed by one or two coats of aluminum metal paint or other suitable protective coating excluding those containing lead pigmentation.

3.6 SCHEDULE

- A. Provide and install items listed in Schedule and shown on Drawings with anchorage and attachments necessary for installation.
- B. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
- C. Items of Work Custom Fabricated
 1. Steel columns not included in Section 05120: Schedule 40 steel; prime paint, galvanized when exterior location.
 2. Pipe bollards, schedule 40 steel, galvanized finish.
 3. Lintels, ledges, shelf angles, and channels and plates not attached to structural framing, for support of decking, joists, [and masonry] galvanized finish.

4. Miscellaneous Steel Shapes: Channels, wide flange shapes, angles, plates, tubing, connections, and bolts where shown and detailed on Drawings. Hot-dip galvanize where exposed to weather or touching exterior masonry after fabrication. Shim under mechanical units to provide a level frame on which to set units. Rest frame directly on joists, not on deck. Provide an angle frame supported by structure around roof penetrations including ductwork.
 5. Stainless steel angles.
 6. Extruded aluminum angles.
- D. Roof Screen: Metal decking panels.
1. Sheet Steel: ASTM A 611, Grade C, prime painted.
 2. Welding Materials: AWS D1.1 and D1.3.
 3. Primer: Grey oxide type.
 4. Posts: 3 inch diameter steel tubes, galvanized.
 5. Final Painting: Refer to Section 09910.

END OF SECTION

SECTION 05513

STEEL ROOF LADDER

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Vertical metal ladders.
- C. Alternate Bids: Work of the section is affected by Alternate Bids. Refer to Section 01230.

1.2 SYSTEM DESCRIPTION

- A. Design Requirements: Fabricator is responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
 - 1. Employ registered professional engineer, licensed to practice structural engineering in jurisdiction where project is located, to engineer each component of ladder system.
- B. Structural Requirements: In addition to requirements shown and specified, comply with ANSI A14.3 for design, materials, fabrication, and installation of component parts.

1.3 SUBMITTALS

- A. General: Submit following items in accordance with Section 01330.
- B. Product Data: Submit for primer paint.
- C. Shop Drawings: Stamp with seal and signature of professional engineer responsible for design.
 - 1. Indicate dimensions, fabrication and installation details. Indicate size and type of fasteners, welds, accessory items, shop finish and method of anchorage.
- D. Informational Submittals: Submit following:
 - 1. Support reactions design data.
 - 2. Qualification Data: Engineer's qualification data.
 - 3. Qualification Data: Fabricator's qualification data.
 - 4. Certificates verifying AWS qualifications within previous 12 months for each welder employed for Work.
 - 5. Certifications specified in Quality Assurance article.

1.4 QUALITY ASSURANCE

- A. Engineer Qualifications: Registered professional engineer licensed to practice structural engineering in jurisdiction where Project is located, with minimum of 5 years experience in design of metal ladders.
- B. Fabricator Qualifications: Company specializing in fabricating work specified in this Section with minimum 5 years experience.
- C. Welder Qualifications: AWS certified within past 12 months for each type of weld required.
- D. Certifications:
 - 1. Fabricator's certification that products furnished for Project meet or exceed specified requirements.
 - 2. Engineering Certifications.
 - 3. Certification that code required design loadings have been complied with in design and fabrication of work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Section: ASTM A 36/A36M.
- B. Steel Tubing: 1-1/4 inches NPS ASTM A 53, Grade B, Schedule 40, or as required for design loading.
- C. Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as required for design loading.
- D. Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as required for design loading.
- E. Galvanized, Structural Steel Sheet: ASTM A 653, Quality SQ, Coating Designation G90, Grade as required for design loading.
- F. Steel Bar Grating Treads: ASTM A 36.
- G. Fasteners:
 - 1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for type, grade and class required.
 - 2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 - 3. Lag Bolts: Square head type, FS FF-B-561.
 - 4. Machine Screws: Cadmium plated steel, FS FF-S-92.
 - 5. Wood Screws: Flat head carbon steel, FS FF-S-111.
 - 6. Plain Washers: Round, carbon steel, FS FF-W-92.
 - 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 - 8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
 - 9. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27 Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

2.2 VERTICAL LADDERS

- A. Type: Vertical steel ladders consisting of following components:
 - 1. Side Rails: 1-1/2 inches steel bars spaced as detailed on Drawings or not less than 18 inches between.
 - 2. Rungs: 1-1/4 inch minimum solid round steel bars spaced 12 inches maximum on center, punched through stringers and plug welded.
 - 3. Provide non-slip surface on top of each rung, either by coating rung with aluminum oxide granules set in epoxy resin adhesive, or by using type of manufactured rung which is filled with aluminum oxide grout.
 - 4. Angle Supports: Support ladders by steel angles bolted to walls and floors to provide minimum of 7 inches from face of wall to centerline of rungs. Locate at 5 feet on center and within 16 inches of top and bottom.
 - 5. Safety Handrails: Extend rails 42 inches above top rung and anchor to structure, if adjacent structure does not extend above top rung, gooseneck extended rails back to structure.

2.3 FABRICATION PROCEDURES

- A. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
 - 1. Verify measurements in field for work fabricated to fit job conditions. Before starting work, examine adjoining work on which work of this section is in any way dependent for workmanship and fit.
 - 2. Fabricate finish surfaces smooth, unless otherwise specified.
 - 3. Cut, punch, drill and tap for attachment of work coming in contact with ladder where indicated or where directions for same are given prior to or with approval of shop drawings.

- 4. Make joints as strong and rigid as adjoining sections. Make exposed joints close fitting and where jointing is least conspicuous. Unless otherwise indicated or specified, full weld joints and seams and dress smooth where exposed.
- B. Weights of Connections and Accessories: Meet design loads.

2.4 SURFACE PREPARATION AND APPLICATION

- A. Steel Surfaces to be Primed: Dry and free of dirt, oils, rust, salt and other contaminants.
 - 1. Blast-clean steel to "commercial grade" SSPC SP-6 for general use.
- B. Apply primers in accordance with manufacturer's instructions.

2.5 GALVANIZING

- A. Provide hot-dip galvanized coating in accordance with:
 - 1. ASTM A 153 - Iron and Steel Hardware.
 - 2. ASTM A 123 - Rolled, pressed and forged steel shapes, plates, bars and strips 1/8 inch thick and heavier.
- B. Galvanizing Repair Paint: MIL-P-21035 or SSPC-Paint-20.
 - 1. Acceptable Products:
 - a. Valspar M-Z-2 (13-F-2), Valspar, Baltimore, MD,
 - b. Tnemec 90-93, Tnemec Co., Kansas, MO.
 - c. Carboline Galvanox, Carboline Company, St. Louis, MO.
 - d. Substitutions: Submit in accordance with Section 01600.

2.6 FINISHES

- A. Final painting under Section 09910.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.

3.2 INSTALLATION

- A. Set items in position, align and brace securely until permanent anchorage is made.
 - 1. Install supporting members, fastenings, framing, hangers, bracing brackets, straps, bolts and angles required to set and connect work to structure.
 - 2. Provide suitable anchors.
- B. Upon completion of installations, re-examine work and provide additional shims, washers, anchors and corrective work to ensure that installation is firm, tight, anchored, in alignment with neat fits, without distortion, unsightly fastenings, raw edges or protrusions.

3.3 PROTECTION

- A. Protect finished installation under provisions of Section 01500.

END OF SECTION

SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Steel pipe handrails, railings, and balusters.
 - 2. Steel pipe guardrails.

1.2 DESIGN REQUIREMENTS

- A. Design Requirements:
 - 1. Fabricator is responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
 - 2. Employ registered professional engineer, licensed to practice structural engineering in jurisdiction where Project is located, to engineer each component of handrail and railing system.
 - 3. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
 - 4. Provide concealed fastening wherever possible.
 - 5. Make modifications only to meet field conditions and to ensure fitting of components.
 - 6. Obtain Architect's approval of modifications.
- B. Structural Requirements:
 - 1. Handrails: Capable of withstanding following loads applied as indicated.
 - 2. Concentrated load of 250 pounds applied at any point in any direction.
 - 3. Uniform load of 50 pounds per linear foot applied in any direction.
 - 4. Concentrated and uniform loads above need not be applied simultaneously.
- C. Guardrail system: Capable of withstanding following loads applied as indicated.
 - 1. Concentrated load of 200 pounds applied at any point and in any direction at top of guardrail system.
 - 2. Uniform load of 50 pounds per linear foot applied horizontally at the top of the guardrail system and a simultaneous load of 100 pounds per linear foot applied vertically downward at the top of the guardrail system.
 - 3. Concentrated and uniform loads above need not be applied simultaneously.
- D. Infill area of guardrail system: Intermediate rails, balusters, pickets and panel fillers capable of withstanding horizontal concentrated load 200 pounds applied on 1 square foot area at any point. Above load need not be assumed to be acting concurrently with horizontal loads on railing system.

1.3 INTERFACE WITH ADJACENT SYSTEMS:

- A. Integrate design and connections with adjacent construction.
- B. Accommodate allowable tolerances and deflections for structural members in installation.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01330.
- B. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.
- C. Submit manufacturer's installation instructions under provisions of Section 01330.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect products in accordance with section 01600.
- B. Store materials off the ground and in their original protective wrapping.

PART 2 PRODUCTS

2.1 RAILING SYSTEM

- A. Round Pipe: ASTM A 53, Type S - seamless, Grade B, standard weight class, unless noted otherwise.
- B. Structural Plate and Bars: ASTM A 36.
- C. Headed Stud Anchors: ASTM A 108, grades 1010 through 1020, AWS D1.1, Section 7, Grade B, forged steel, headed, uncoated.
- D. Pipe Sleeves:
 - 1. ASTM A 53 with steel plate welded to bottom, hot-dip galvanized finish.
 - 2. Size to provide 1/8 inch minimum space between inside of sleeve and outside of railing post after allowance for placement and erection tolerances. Minimum length of 5 inches and minimum diameter of 1 inch larger than maximum post dimension.
 - 3. Provide temporary closure on top of sleeve to prevent concrete and moisture penetration.
- E. Fittings: Fabricate tees, elbows, splice connections, wall returns, wall ends, rail caps, post caps, and accessories from same material and finish as railing.
- F. Mounting Flanges and Anchor Plates:
 - 1. Fabricate of same material and finish as railing.
 - 2. Provide holes for anchorage to adjacent construction.
- G. Handrail Brackets:
 - 1. ASTM A 47M or ASTM A 48 iron casting or fabricate of same material as railing.
 - 2. Same finish as railing.
- H. Fasteners:
 - 1. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
 - 2. Lag Bolts: Square head type FS FF-B-561.
 - 3. Machine Screws: Cadmium plated steel, FS FF-S-92.
 - 4. Wood Screws: Flat head carbon steel, FS FF-S-111.
 - 5. Plain Washers: Round, carbon steel, FS FF-W-92.
 - 6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 - 7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type class and style required.
 - 8. Lock Washers: Helical spring type carbon steel FS FF-W-84.
 - 9. Concrete Expansion Anchors:
 - a. Finish: Zinc-plated.
 - b. Acceptable Product:
 - 1) "HSL Anchor" as manufactured by Hilti Inc., Tulsa, OK.
 - 2) Substitutions: Submit in accordance with Section 01600.
 - 10. Finish: Provide hot-dip zinc coating in accordance with ASTM A 153 for anchors in exterior use.
- I. Non-Shrink Grout:
 - 1. Premixed and packaged non-ferrous aggregate, non-staining, shrinkage-resistant, non-corrosive, non-gaseous complying with CRD C621, 5000 psi minimum compressive strength.
 - 2. Acceptable products and manufacturers:
 - a. Euco-NS, Euclid Chemical Co., Cleveland, OH.
 - b. Crystex, L&M Construction Chemicals, Omaha, NE.
 - c. SonogROUT 10K, ChemRex Inc./Sonneborn, Minneapolis, MN.
 - d. Substitutions: Submit in accordance with Section 01600.

2.2 FABRICATION

- A. General:
- B. Verify dimensions on site prior to shop fabrication.
- C. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling. Clearly mark units for re-assembly and coordinated installation.
- D. Design Requirements:
 - 1. Return railings to walls at ends.
 - 2. Extend railings 12 inches beyond top riser and 12 inches beyond plus 1 tread beyond bottom riser where not continuous.
 - 3. Make clear distance between components of guardrail infill such that 4 inch diameter sphere cannot pass through opening.
- E. Railing Components:
 - 1. Use prefabricated fittings for joining railing components.
 - 2. Use prefabricated radius bends or bend pipe to form radius bends free from buckles or twist, with smooth finished surfaces.
 - 3. Fabricate joints exposed to weather to exclude water or provide weep holes.
 - 4. Remove burrs from exposed cut edges.
 - 5. Close exposed ends of pipe and tube with cap or end fitting.
 - 6. Fabricate toe boards or kick plate of 4 inches wide by 1/8 inch steel plate unless noted otherwise.
- F. Connection of Railing Components:
 - 1. Use internal welding connector sleeves.
 - 2. Completely weld joints, without undercutting or overlap.
 - 3. Remove slag, grind exposed welds smooth and contour surface to match adjacent surfaces.
 - 4. Bolted or riveted connections are not acceptable.

2.3 SURFACE PREPARATION AND APPLICATION

- A. Steel Surfaces to be Primed: Dry and free of dirt, oils, rust, salt and other contaminants.
 - 1. Blast-clean steel to "commercial grade" SSPC SP-6 for general use.
- B. Apply primers in accordance with manufacturer's instructions.

2.4 UNIVERSAL PRIMER

- A. Manufacturer's standard, lead and chromate free primer, capable of providing sound foundation for field applied top coats despite prolonged exposure.
 - 1. Maximum Allowable Dry Time: Four hours to touch; 24 hours to re-coat.
 - 2. Compatible with finish paint system specified in 09910.
- B. Acceptable Products:
 - 1. Valspar 13-Y-5, Valspar, Baltimore, MD.
 - 2. Tnemec, Chem Prime 37H-77, Tnemec, Kansas City, MO.
 - 3. Carboline Multi-Bond 150, Carboline Company, St. Louis, MO.
 - 4. Substitutions: Submit in accordance with Section 01600.

2.5 GALVANIZING

- A. Provide hot-dip galvanized coating in accordance with:
 - 1. ASTM A 153 - Iron and Steel Hardware.
 - 2. ASTM A 123 - Rolled, pressed and forged steel shapes, plates, bars and strips 1/8 inch thick and heavier.
- B. Galvanizing Repair Paint: MIL-P-21035 or SSPC-Paint-20.
 - 1. Acceptable Products:
 - a. Valspar M-Z-2 (13-F-2), Valspar, Baltimore, MD,
 - b. Tnemec 90-93, Tnemec Co., Kansas, MO.
 - c. Carboline Galvanox, Carboline Company, St. Louis, MO.
 - d. Substitutions: Submit in accordance with Section 01600.

2.6 FINISHES

- A. Apply primers in accordance with manufacturer's instructions.
- B. Steel surfaces to be primed must be dry and free of dirt, oils, rust, salt and other contaminants.
- C. Universal Primer:
 - 1. Interior handrails and guardrails.
 - 2. Final painting under Section 09910.
- D. Galvanized:
 - 1. Exterior railing.
 - 2. Final painting under Section 09910.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.
- B. Verify installation tolerances of items embedded in other work:
 - 1. Spacing: Plus 3/8 inch.
 - 2. Alignment: Plus 1/4 inch.
 - 3. Plumbness: Plus 1/8 inch.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, embedded sleeves, concrete inserts, and anchor bolts.
- B. Clean sleeves of debris.

3.3 INSTALLATION

- A. Install in accordance with approved shop drawings.
- B. Fit exposed connections accurately to form tight, hairline joints. Make joints as strong and rigid as adjoining construction. Fully weld joints and seams and dress smooth where exposed.
- C. Set posts plumb and align to within 1/4 inch in 12 feet. Set rails horizontal or parallel to rake of steps or ramp to within 1/4 inch in 12 feet.
- D. Anchoring Posts:
 - 1. Anchor posts as indicated on the Drawings.
 - 2. Anchor posts by welding to imbedded plates preset and anchored in concrete.
 - 3. Anchor posts with floor flange or fascia flange and fascia brackets to concrete with concrete expansion anchors and to steel by bolting or field welding.
- E. Attach Wall Rails:
 - 1. Install with minimum 1-1/2 inches clearance from inside face of handrail to finished wall surface.
 - 2. Concrete and solid masonry: Expansion anchors; expansion shields and concealed hanger bolts, or exposed lag bolt.
 - 3. Hollow masonry: Toggle bolts
 - 4. Stud partitions: Secure to metal grounds with toggle bolt; wood blocking with lag bolt.
 - 5. Provide wall handrails brackets spaced maximum of 6 feet on center or as noted on Drawings.
- F. Expansion Joints:
 - 1. Provide slip joint with internal sleeve extending 2 inches beyond joint on each side.
 - 2. Fasten sleeve to one side only.
 - 3. Locate expansion joints within 6 inches of post.
 - 4. Provide at intervals of maximum 40 feet centers for railings exceeding 60 feet.

3.4 CLEANING

- A. Touch-Up Painting:
 - 1. Perform immediately after erection.

2. Clean field welds of flux.
3. Power-tool clean abraded shop paint.
4. Paint exposed areas with shop primer.
5. Clean field welds and abraded areas of galvanized surfaces and apply galvanizing repair paint per ASTM A 780.

END OF SECTION

SECTION 05721

ORNAMENTAL RAILINGS

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. Black steel ornamental railings.
 - 2. Ornamental brackets.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Black Steel: 60 percent of minimum yield strength.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Welded connections.
 - 4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- D. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code."
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Provide allowance for trimming and fitting at site.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. **Black Steel Ornamental Railings:**
 - a. Rutledge Wood Products Inc.
1915 Virginia Circle
Dentaon, TX 76209
(940-383-3879)

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
 - 1. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Stainless-Steel Components: Type 304 stainless-steel fasteners.
 - 2. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work, unless otherwise indicated.
 - 1. Provide rounded-head machine screws for exposed fasteners, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 - H. Form changes in direction as follows:
 - 1. As detailed.
 - I. Close exposed ends of hollow railing members with prefabricated end fittings.
 - J. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
 - K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
 - L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- 2.6 FINISHES, GENERAL
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- 2.7 ORNAMETAL BRACKETS AND HOOKS
- A. Ornamental brackets and hooks as indicated on Drawings.
 - B. Acceptable Products and Manufacturers:
 - 1. Brushed Nickel Double Coat Hook: Similar to Item No. 081492951100 InterDesign Wall Mount Coat Hook by Organize-It; 800-210-7712.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.
- 3.2 INSTALLATION, GENERAL
- A. Fit exposed connections together to form tight, hairline joints.
 - B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
 - C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
 - D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

3.6 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean and polish glass.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Lumber.
 - 2. Plywood.
 - 3. Gypsum sheathing.
 - 4. Preservative treatment.
 - 5. Fire retardant treatment.
 - 6. Felt building paper.
 - 7. Fasteners.
 - 8. Related accessories.

1.2 SUBMITTALS

- A. Submit items in accordance with Section 01330.
- B. Product Data: Provide technical data on wood preservative and fire retardant treatment materials and application techniques and instructions.
- C. Manufacturers Certificates: Certify that products meet or exceed specified requirements.
 - 1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with referenced standards.
 - 2. Preservative Treated Wood: Submit certification for water-borne preservative that moisture content was reduced to maximum 19 percent for lumber and 15 percent for plywood after treatment.
 - 3. Fire Retardant Treated Wood: Submit certification by testing plant stating chemicals and process used, conformance with referenced standards and governing ordinances, and non-bleeding quality of the treatment.
 - 4. Structural Values: Where materials are provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use, in the form of a signed copy of the applicable portion of the producer's grading rules for design values.

1.3 QUALITY ASSURANCE

- A. Lumber Grading: Lumber Grading Rules and Wood Species in accordance with Voluntary Product Standards. Grading rules of following associations apply to materials furnished.
 - 1. Southern Pine Inspection Bureau (SPIB).
 - 2. West Coast Lumber Inspection Bureau (WCLIBB).
 - 3. Western Wood Products Association (WWPA).
- B. Grade Marks: Identify lumber and plywood by official grade mark.
 - 1. Lumber: Include symbol of grading agency, mill name, grade, species, grading rules and condition of seasoning at time of manufacturer.
 - 2. Plywood: Include type, class identification index, and agency mark.
 - 3. Pressure Treatment: Include quality mark of grading agency which maintains continued supervision, testing, inspection, and re-examination service over product quality as described in AWPA standards.
 - 4. Fire Retardant Treated Wood: Mark attesting FR-S rating.
- C. Requirements of Regulatory Agencies

1. Preservative and Pressure Treated Lumber and Plywood: Comply with American Wood Preservers Bureau Standards.
2. Fire Retardant Treated Materials: Comply with Underwriters Laboratories, Inc. and ASTM E 84, for maximum flame spread of 25.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with Section 01600.
- B. Store products above ground, on platforms or skids, and covered with waterproof coverings. Provide for adequate air circulation.
- C. Do not store seasoned materials in damp or wet locations.
- D. Support products in such a way as to prevent warping and distortion.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

- A. General: Where stress rating values are given in lieu of grades, select any quality which will meet structural requirements.
- B. Lumber
 1. Grading Rules: PS 20.
 2. Dimensions: Lumber dimensions are nominal except for posts and timbers; actual dimensions conform to industry standards established by the American Lumber Standards Committee and applicable rules writing agencies. Provide sizes as detailed.
 3. Moisture Content: 19 percent maximum moisture content after treatment for fire retardant and preservative treated woods.
 4. Surfacing: Surface four sides (S4S), unless noted otherwise.
 5. Species: Southern Yellow Pine or West Coast Douglas Fir, unless noted otherwise.
 6. Finger-Jointed Lumber: Not allowed.
 7. Uses, Grades, and Stress Ratings
 - a. Non-structural light framing (2 to 4 inch thick, 2 to 4 inch wide):
 - 1) General Framing: Standard and better or Stud grade.
 - 2) Plates, Blocking, Bracing, Nailers: Utility grade.
 - b. Structural Framing: Refer to Drawings.
- C. Plywood
 1. Grading Rules: PS 1, using group 1 to 4 species as required for rating.
 2. Exposures: Provide exposure ratings as indicated.
 3. Thickness: As detailed or noted, or otherwise as required to maintain span capability.
 4. Uses, Grades, Ratings
 - a. Roof Deck: APA Rated Structural 1 Exterior Plywood, minimum 23/32 inch thick; tongue and groove.
 - 1) Oriented Strand Board (OSB) may be substituted, provided it meets span rating of plywood and is approved by Structural Engineer and Architect.
 - b. Wall and Parapet Sheathing: B-C/Exposure 1-APA, Rated Sheathing 16/0 span rating.
 - 1) Thickness: Refer to Drawings.
 - c. Subflooring: C-D/Exposure 1-APA Rated Sheathing 23/32-inch minimum thickness (or as otherwise indicated on structural drawings), tongue and grooved edges, plywood.
 - 1) Oriented Strand Board (OSB) may be substituted, provided it meets span rating of plywood and is approved by Architect.
 - d. Equipment Panel Boards: C-D/Exposure 1-APA, minimum 1/2-inch thick.

2.2 GYPSUM SHEATHING

- A. Exterior Gypsum Sheathing behind Fiber-Cement Panels [and Masonry Veneer].

1. Meeting requirements of ASTM C 79.
 2. Maximize use of recycled or synthetic gypsum with minimum of 10 percent.
 3. Use recycled newsprint including post-consumer waste for facing paper.
 4. Thickness: 1/2 inch.
 5. Type X for fire-rated assemblies and locations where indicated, regular type at other assemblies.
 6. Core: Asphalt treated water-resistant core.
 7. Faces: Water repellent paper both faces.
 8. Edge: Tongue and groove on long edge.
 9. Acceptable Products:
 - a. National Gypsum Company, Chicago, IL.
 - b. United States Gypsum Company, Chicago, IL.
 - c. Substitutions: Submit in accordance with Section 01600.
- B. Glass Fiber Faced Gypsum Sheathing behind EFIS.
1. Meeting requirements of ASTM C 1177.
 2. Thickness: 1/2 inch.
 3. Type X for fire-rated assemblies and locations where indicated, regular type at other assemblies.
 4. Flame Spread and Smoke Developed: 0 tested in accordance with ASTM E 84.
 5. Acceptable Product:
 - a. G-P Dens-Glass Gold Exterior Sheathing by Georgia-Pacific, Atlanta, GA.
 6. Sealant: General purpose silicone, ASTM C 920, Type S, Grade NS.
 - a. Class: 25. Joint movement range without cohesive/adhesive failure plus or minus 50 percent of joint width.
 - b. Uses: NT, M, G, A, O.
 - c. Low modulus, single component, neutral curing, non-staining, non-bleeding silicone sealant.
 - d. Color: As selected by Architect from manufacturer's standard colors.
 - e. Acceptable Products:
 - 1) 795 by Dow Corning.
 - 2) Silpruf by General Electric, Waterford, NY.
 - 3) Rhodorsil 5C, Rhone-Poulenc, Inc., Monmouth Junction, NJ.
 - 4) Substitutions: Submit in accordance with Section 01600.

2.3 ACCESSORIES

- A. Felt Building Paper: Organic saturated felt, ASTM D 226, Type, No. 15 unperforated.]
- B. Plastic Cement: ASTM D 2822, asphalt base.
- C. Sheathing Tape:
 1. Self-adhering rubberized asphalt tape.
 2. Thickness: 30 mils minimum.
 3. Permeance: 0.1 perms.
 4. Puncture Resistance: ASTM E 514, 40 pounds-force, minimum.
 5. Tensile Strength of Membrane: ASTM D 412, 600 psi, minimum.
 6. Pliability: 180 degree bend over 1 inch at 25 degrees F.
 7. Primer: As recommended by manufacturer.
 8. Acceptable Products:
 - a. JT-30 Exterior Sheathing Joint Tape by Polyguard Products, Inc., Ennis, TX.
 - b. Sure-Seal Splice Tape by Carlisle Syntec Systems, Carlisle, PA.
 - c. Perm-A-Barrier Tape by WR Grace, Cambridge, MA.
 - d. Substitutions: Submit in accordance with Section 01600.
- D. Fasteners
 1. Provide fasteners in sizes, spacings, and locations to suit applications. Hot dip galvanize unless noted otherwise.
 2. Anchors:
 - a. Toggle Bolt Type: For anchorage to hollow masonry.

- b. Expansion Shield and Lag Bolt Type: For anchorage to solid masonry or concrete.
 - c. Bolts or Ballistic Fasteners: For anchorage to steel.
- 3. Bolts: ASTM A 307 with nuts and washers.
- 4. Anchor Bolts: ASTM A 307 with nuts and washers.
- 5. Toggle Bolts: ASTM A 307.
- 6. Lag Screws and Lag Bolts: ANSI B18.2.1 with washers.
- 7. Wood screws: ANSI B18.6.1.
- 8. Nails, Staples, and Spikes: FS FF-N-105.
- 9. Metal Nailing Discs
 - a. Flat caps, minimum 1 inch diameter.
 - b. Minimum 30 gage sheet metal.
 - c. Formed to prevent dishing.
 - d. Bell or cup shapes not acceptable.
- 10. Gypsum Board Screws:
 - a. ASTM C 1002.
 - b. Length: Three times sheathing thickness.
 - c. Finish: Manufacturer's standard rust-inhibitive paint.
- 11. Provide stainless steel fasteners used in contact with preservative-treated wood.

2.4 WOOD TREATMENTS - SHOP PREPARED

- A. Preservative Treatment by Pressure Process: AWWA C2 (lumber) and AWWA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Ammoniacal, or amine, copper quat (ACQ).
 - b. Ammoniacal copper citrate (CC).
 - c. Copper azole, Type A (CBA-A).
 - 2. Chromated copper arsenate (CCA) will not be permitted.
 - 3. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
 - 4. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
 - 5. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
 - 6. Application: Treat items indicated on Drawings, and the following:
 - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- B. Fire Retardant Treated Wood
 - 1. Use fire retardant treated wood for wood blocking above ceilings, blocking within return air plenums, blocking within walls, and other areas required by reference building codes.
 - 2. Comply with AWWA C20 for lumber and AWWA C27 for sheet materials.
 - 3. Not detrimental to structural properties of plywood when exposed to elevated temperatures and high humidity when tested in accordance with ASTM D 5516.
 - 4. Not capable of bleeding through or adversely affecting type of finish indicated.
 - 5. Not capable of corroding metals when tested in accordance with MIL-L-199140E.
 - 6. Provide finished products with maximum flame spread rating of 25 when tested in accordance with ASTM E 84.
 - 7. Acceptable Products and Manufacturers - Interior

- a. D-Blaze by Chemical Specialties, Inc., Charlotte, NC.
 - b. Dricon by Hickson Corporation, Atlanta, GA.
 - c. Flame-Proof by Osmose Wood Preserving Co., Griffin GA.
 - d. Pyroguard by Hoover Treated Wood Products, Thomson, GA.
 - e. Substitutions: Submit in accordance with Section 01600.
8. Acceptable Products and Manufacturers - Exterior
- a. Exterior Fire-X by Hoover Treated Wood Products, Thomson, GA.
 - b. Substitutions: Submit in accordance with Section 01600.
9. Where treated items are exposed to exterior or to high humidity or are to have a transparent finish applied, provide materials that show no change in fire hazard classification when subjected to standard rain test (UL 790).
10. Use fire retardant treatment which will not bleed through or adversely affect type of finish indicated and which does not require brush treatment of field- made end cuts to maintain fire hazard classification.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions that will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Wood Treatment Applied to Cut Surfaces at Site: Comply with AWWA M4.
 - 1. Apply preservative treatment in accordance with manufacturer's instructions to:
 - a. Preservative pressure treated wood site-sawn ends.
 - b. Holes cut through preservative pressure treated wood.
 - 2. Allow preservative to cure prior to erecting members.

3.3 INSTALLATION

- A. General
 - 1. Discard units of material with defects that might impair quality of work, and units which are too small to fabricate work with minimum joints or optimum joint arrangement.
 - 2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Scribe and cope as required.
 - 3. Securely attach carpentry work to substrates by anchoring and fastening as required by recognized standards and as required to draw members into place and securely hold same unless otherwise indicated. Use washers under bolt heads.
 - 4. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
 - 5. Make tight connections between members to develop full strength of members.
 - 6. Install fasteners without splitting of wood.
 - 7. Predrill as necessary.
 - 8. Comply with APA E30a requirements for plywood.
 - 9. Install fasteners at spacing recommended by NFPA National Design Specifications for Stress Grade Lumber and Its Fastening - 1973 for lumber and APA Guide E30e for Plywood, unless more restrictive code requirements dictate tighter spacing or heavier fasteners.
 - 10. Locate members as indicated on the drawings. Do not change size, spacing or spans without specific approval of Architect. Take care to place proper grades and species of members where indicated in accordance with the lumber schedule herein.
 - 11. Temporarily brace framing at the end of each day's work until framing is completed and securely anchored. Leave temporary bracing in place as long as required for safety. As work progresses, securely connect work to compensate for dead load, wind, and erection stresses.

12. Shimming:
 - a. Concrete and masonry bearing: Use steel or slate shims.
 - b. Metal and Wood Bearing: Do not use shims.
13. Wood Fire Retardant Pressure Treatment:
 - a. Do not rip cut.
 - b. Do not mill.
 - c. Only end cuts and bored holes are permitted.
- B. Wood Grounds, Nailers, Cants, and Blocking
 1. Provide where required for screeding or attachment of other work.
 2. Form to shapes cut as necessary for true line and level of work to be attached.
 3. Coordinate location with other work involved.
 4. Attach to substrates to support applied loading.
 5. Countersink bolts and nuts flush with surfaces and where built into masonry work.
 6. Where possible, anchor to formwork before concrete placement.
 7. Provide permanent grounds of dressed, preservative treated, key beveled lumber not less than 1/2 inch wide, and of thickness required to bring face of ground to exact thickness of finish material involved.
 8. Provide continuous blocking.
 9. Remove temporary grounds when no longer required.
 10. Curb roof openings except where prefabricated curbs are provided.
 11. Provide solid lumber preservative cants where roof surfaces meet walls, curbs or other vertical projections.
 12. Provide fire retardant treated in-wall blocking and structural support for wall mounted equipment and accessories.
- C. Plywood Equipment Panel Boards: Install for equipment where indicated.
 1. Oversize panel by 12 inches beyond equipment perimeter.
- D. Wood Nailers: Provide at roof openings, terminations, and other locations as indicated to match thickness of roof insulation.
- E. Wood Cants: Provide where roofing meet walls, curbs, and other vertical projections.
- F. Wood Curbs: Provide at roof openings except where prefabricated curbs are provided. Form corners by lapping side members alternately.
- G. Wood Furring:
 1. Run in longest practical lengths.
 2. Butt ends together.
 3. Rigidly secure to substrate.
- H. Joists
 1. Install with crown edge up.
 2. Support ends of each member minimum of 3 inch bearing on wood and metal.
 3. Do not notch in middle third of joist span.
 4. Do not exceed 1/6 of depth of member for depth of notches in top or bottom of joists.
 5. Limit end notches to total of 1/3 depth of member.
 6. Do not bore holes closer than 2 inches from top or bottom of joist.
 7. Limit bore holes diameter to 1/3 depth of member.
 8. Frame openings with headers and trimmers; double headers and trimmers where span of header exceeds 6 feet, or as otherwise noted on the Drawings.
 9. Lap members framing from opposite directions of beams, girders or partitions not less than 4 inches. Provide solid blocking over supports.
 10. Provide bridging between joists where nominal depth-to-thickness ratio exceeds four. Use bevel cut 1 by 4 inch or 2 by 3 inch members, or solid wood members full depth of joist, or premanufactured steel bridging. Refer to structural drawings for locations other than mid-span.
 11. At joist and truss bearing locations, toe nail each side as indicated on Drawings.
 12. Refer to Section 06195 for premanufactured plywood joists.
- I. Plywood Roof and Wall Sheathing
 1. Install with long edge perpendicular to framing.

2. Allow 1/8 inch open space between panel ends and edges for expansion and contraction.
 3. Place ends over framing members. Install over two or more spans with end joints staggered and face grain perpendicular to supports.
 4. Secure with galvanized nails to each support spacing fasteners at 12 inch o.c. for intermediate supports and 6 inch o.c. for ends supports (or at spacing as otherwise indicated on structural drawings), using 8d ring shank nails. Staples will be allowed as a substitution if allowed by governing codes, Architect, and Owner.
 5. Use edge clips at all unsupported edges at roof sheathing, spaced at 12" maximum on center.
- J. Plywood Floor Sheathing:
1. Plywood
 - a. Install tongue and groove panels with joints between panels staggered over center of supports.
 - b. Allow 1/8 inch open space between panel ends and edges for expansion and contraction.
 - c. Install over two or more supports and with end joints staggered and face grain perpendicular to supports.
 - d. Glue with APA approved adhesive and nail to supports 3/8" from edge, using 8d ring shank nails.
- K. Stud Framing
1. Plates and stud members
 - a. Provide single bottom plate and double top plates for all partitions 2 inch x width of studs. Cut bottom plates at upper floor door openings to allow continuous pour of lightweight concrete.
 - b. Stud spacing: As indicated on Drawings.
 - c. Provide studs in continuous lengths without splices.
 - d. End nail in bottom plate and end nail to lower top plate.
 - e. Overlap double top plates minimum of 32 inches except at outside corners where overlap shall be 3-1/2 inches.
 - f. Face nail upper top plate to lower top plate.
 - g. Nail bottom plate to wood construction.
 - h. Anchor bottom plate to concrete structure with anchor bolts, lag bolts, or power driven studs, spaced as required to resist lateral forces as established by building code and as determined by Architect and Owner. Provide a minimum two anchors per piece.
 - i. Triple studs at corners and partitions intersections.
 - j. Anchor studs abutting masonry or concrete with 1/2 inch anchor bolts, maximum spacing of 2 feet o.c.
 - k. Partitions parallel with joists: Locate joists directly below studs.
 - l. Openings must be square, plumb, and level.
 2. Headers
 - a. Continuous headers, same width as studs, depth required to span widest opening. Provide solid bearing. No shimming allowed.
 - b. Toenail headers to studs and opening framing.
 - c. Stagger joints in individual header members minimum of three stud spaces, allowing no joints to occur over openings.
 - d. Refer to structural drawings for additional information.
 3. Blocking
 - a. Wedge, align, and anchor blocking with countersunk bolts, washers and nuts, or nails.
 - b. Locate blocking to facilitate installation of finishing materials, fixtures, specialty items, and trim.
 4. Place two beads of non-hardening sealant continuous under exterior and unit demising framed walls on cementitious foundations. Refer to Section 07920 for material and installation.

5. Stud framing nailing schedule: Refer to Drawings.
- L. Posts or Columns
 1. Provide two surfaces on posts at right angles to each other for installation of interior finish materials.
 2. Erect posts straight, plumb with straight edge and level, and brace with tack boards at plate and sill.
 3. Provide specified metal anchor and attachment devices.
- M. Gypsum Sheathing
 1. Erect horizontally, with edge butted tight and ends occurring over framing member.
 2. Secure with galvanized power driven screws to each support in accordance with manufacturer's recommendations.
 3. Cover sheathing with sheet dampproofing as specified in Section 07114.
- N. Sheathing Tape:
 1. Clean substrate of dirt, dust, and materials that may impair adhesion.
 2. Apply primer, when required, in accordance with manufacturer's requirements.
 3. Apply to:
 - a. Wall and parapet sheathing.
 - b. Panel joints, inside corners, and outside corners.
 - c. Holes and penetrations through sheathing.
 4. Apply with center of tape aligned with joint line.
 5. Use 6 inch wide tape at corners.
 6. Install without fishmouths and wrinkles.
 7. Press tape into firm contact with substrate.
 8. Lap tape ends minimum 2 inches.
 9. Continuously tape joints, outside corners and penetrations in sheathing.]
- O. Glass Fiber Faced Gypsum Sheathing: Erect horizontally with edge butted tight and ends occurring over framing member. Space framing members at not more than 16 inches on center.
 1. Secure to steel framing with bugle head steel screws to each support in accordance with manufacturer's recommendations but with fasteners spaced at not more than 8 inches on center vertically.
 2. Apply continuous bead of silicone sealant at joints and trowel flat to establish water tight condition.

3.4 TOLERANCES

- A. Framing members: 1/4 inch maximum from true position.
- B. Surface flatness of floors/roofs: 1/4 inch in 10 feet maximum.

3.5 PROTECTION

- A. Protect products from moisture absorption and subsequent warping or deterioration until subsequent construction can proceed.

END OF SECTION

SECTION 06185

STRUCTURAL GLUED-LAMINATED TIMBER

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 framing using structural glued-laminated timbers.

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide structural glued-laminated timber, including connectors, capable of withstanding structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117--DESIGN or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

1.5 SUBMITTALS

- A. Product Data: For [structural glued-laminated timber] [and] [connectors].
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. Include installation instructions for timber connectors.
- B. Shop Drawings: Show layout of structural glued-laminated timber system and full dimensions of each member. Indicate species and laminating combination, adhesive type, and other variables in required work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.
- D. Qualification Data: For manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA trademark. Place mark on surfaces that will not be exposed in the completed Work.
- B. Quality Standard: Comply with AITC A190.1, "Structural Glued Laminated Timber."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111, "Recommended Practice for Protection of Structural Glued Laminated Timber during Transit, Storage, and Erection."
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC 117--MANUFACTURING or research/evaluation reports acceptable to authorities having jurisdiction.

1. Provide structural glued-laminated timber made from a single species.
- B. Species and Grades for Structural Glued-Laminated Timber: Provide structural glued-laminated timber made from Douglas fir-larch in grades needed to comply with Part 1 "Performance Requirements" Article.
 1. Other species may be submitted in accordance with Section 01600.
- C. Appearance Grade: Industrial appearance grade, complying with AITC 110.
- D. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, pressure treat lumber before gluing according to AWPA C28.
 1. Use oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
 2. After dressing and fabricating members, apply a field-treatment preservative to comply with AWPA M4 to surfaces cut to a depth of more than **1/16 inch(1.5 mm)**.
 - a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
- E. Adhesive: Wet-use type complying with ASTM D 2559.
- F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- G. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.2 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
 2. Round steel bars complying with ASTM A 575, Grade M 1020.
 3. Hot-rolled steel sheet complying with ASTM A 1011/A 1011M, Structural Steel, Type SS, Grade 33.
 4. Stainless-steel plate and flat bars complying with ASTM A 666, Type 304
 5. Stainless-steel bars and shapes complying with ASTM A 276, Type 304
 6. Stainless-steel sheet complying with ASTM A 666, Type 304
- B. Fabricate beam seats as indicated in drawings.
- C. Fabricate beam hangers as indicated in drawings.
- D. Fabricate strap ties as indicated in drawings.
- E. Provide bolts, nuts and flat washers as indicated in drawings.
- F. Finish steel assemblies and fasteners with rust-inhibitive primer, **2-mil(0.05-mm)** dry film thickness.

2.3 FABRICATION

- A. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- B. End-Cut Sealing: Immediately after end-cutting each member to final length[**and after preservative treatment**], apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood-coated for not less than 10 minutes.
- C. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb, with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Lift with padded slings and protect corners with wood blocking.
 - 2. Install structural glued-laminated timber to comply with Shop Drawings.
 - 3. Install timber connectors as indicated.
- B. Framing Built into Masonry: Provide **1/2-inch(13-mm)** clearance at tops, sides, and ends of members built into masonry; bevel cut ends **3 inches(76 mm)**; and do not embed more than **4 inches(102 mm)**, unless otherwise indicated.
- C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
 - 1. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
 - a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.
 - 1. Coordinate wrapping removal with finishing work specified in Division 9. Retain wrapping where it can serve as a painting shield.

END OF SECTION

SECTION 06196

PREFABRICATED OPEN WEB TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions established within General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SECTION INCLUDES

- A. Wood chord and metal open web trusses for roof framing.
- B. Bridging, bracing and anchorage.
- C. Framing for openings.

1.3 SYSTEM DESCRIPTION

- A. Refer to Drawings and governing codes for live and dead load requirements.

1.4 SUBMITTALS

- A. Product Data: Provide truss configurations, bearing and anchor details, and bridging and bracing.
- B. Shop Drawings: Indicate sizes and spacing of trusses, fastener description and spacing, loads and truss cambers, and framed openings. Submit design calculations.

1.5 QUALITY ASSURANCE

- A. Design and manufacture trusses to the standards set forth in the National Evaluation Service, Inc. (NES) Report No. NER-148 or ICBO Evaluation Service Report No PFC-4354.
- B. Perform Work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
- C. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
- D. Design trusses and associated components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the state where the Project is located.
- E. Fabrication by plant listed in NER or ICBO report and under the supervision of a third-party inspection agency.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for loads, seismic zoning, and other governing load criteria.
- B. Conform to UL requirements to achieve rating indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Protect structural components from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. **TJL Truss by Trus Joist Corp.**
 - 1. **National Account Service Center: 800-456-4787.**

2.2 MATERIALS

- A. Comply with NES, Report No. NER-148 or ICBO Evaluation Service Report No PFC-4354.
- B. Chord members, web members, connecting pins, and bearing hardware and attachments: Material and size as required by design.

2.3 ACCESSORIES

- A. Adhesive: Manufacturer's standard.
- B. Wood Support Members and Framing for Openings: In accordance with Section 06100.
- C. Fasteners and Anchors:
 - 1. Fasteners: Electro galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2.4 FABRICATION

- A. Fabricate trusses to achieve structural requirements specified.
- B. Brace members for support during transit.
- C. Provide chord extensions where indicated.
- D. Frame special sized openings in web in plant.

2.5 TOLERANCES

- A. Length bearing to bearing: Plus or minus 1/8 inch.
- B. Depth: Plus or minus 1/16 inch.
- C. Camber:
 - 1. Specified 0 – 7/8 inch: Plus or minus 1/8 inch.
 - 2. Specified 1 inch to 1-7/8 inch: Plus or minus 3/16 inch.
 - 3. Specified 2 inches and over: Plus or minus ¼ inch.

2.6 IDENTIFICATION

- A. Identify each truss with a stamp indicating the truss series, NER or ICBO ES evaluation report number, manufacturer's name, plant number and the independent inspection agency's logo.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate placement of and proper bearing onto support framing.

3.2 ERECTION

- A. Install trusses in accordance with manufacturer's instructions.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Architect.
- E. Place headers and supports to frame openings.
- F. Coordinate placement of sheathing with work of this section.
- G. Notify manufacturer's representative of completion of installation prior to enclosing trusses.

3.3 ERECTION TOLERANCES

- A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06402

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 1. Interior standing and running trim.
 2. Interior frames and jambs.
 3. Flush wood paneling and wainscots.
 4. Interior ornamental work.
 5. Wood cabinets.
 6. Plastic-laminate cabinets.
 7. Plastic-laminate countertops.
 8. Solid-surfacing-material countertops.
 9. Closet and utility shelving.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data: For panel products high-pressure decorative laminate adhesive for bonding, plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, and handrail brackets.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
- C. Samples for Verification:
 1. Lumber with or for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
 2. Veneer-faced panel products with or for transparent finish, 12 by 24 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
 3. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 4. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
 5. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
- D. Product Certificates: For each type of product, signed by product manufacturer.
- E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- F. Qualification Data: For Installer and fabricator.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: 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.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: Red oak, plain or quarter sawn or sliced.
- C. Beadboard:
 - 1. Hardwood Face Veneer: Rustic Grade, Red Oak, plain sliced, double beaded pattern 1-1/2 inch on center, 48 inches by 96 inches by 1/4 inch thickness.
 - 2. Acceptable Product: Beaded Oak Paneling by Timber Products Company, 305 South 4th Street, P.O. Box 269, Springfield, OR 97477-0055, 800-547-9520 or 541-747-4577.
 - a. Contact: Rutledge Wood Products, 1915 Virginia Circle., Denton, TX 76209, 940-383-3879 or 800-850-3733, attention David Rutledge.
- D. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - a. Acceptable Products:
 - 1) Medex, Medex NC, and Medite II by SierraPine.
 - 2) Premier Plus by Weyerhaeuser.
 - 3. Particleboard: ANSI A208.1, Grade M-2 – Exterior Grade.
 - 4. Softwood Plywood: DOC PS 1.
 - 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- E. Flush Paneling, High Pressure Laminate:
 - 1. Wall Paneling:
 - a. High pressure laminate bonded one side and edges, opposite side concealed:
 - 1) A-C EXT-APA, Douglas Fir with "A" face used for bonding surface.
 - 2) Glued solid hardwood edge bands in accordance with AWI, Section 400-8, custom grade.
 - b. Back Bar Paneling:
 - 1) High Pressure laminate bonded one side and edges.
 - a) A-A EXT-APA, Douglas Fir.
- F. Plywood Shelving:
 - 1. Above Check-Out Stands:
 - a. Single layer.
 - b. A-A EXT-APA, Douglas Fir.
 - c. Provide milled trim shape edging as indicated on Drawings.
- G. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Wilsonart International; Div. of Premark International, Inc.
 - 2. Colors and Patterns: Refer to Schedule on Drawings.
- I. Solid-Surfacing Material: Refer to Section 06660.
- J. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick, unless otherwise indicated.

- K. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
 - 1. Interior Type A: Low-hygroscopic formulation.
 - 2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
 - 3. Kiln-dry materials before and after treatment to levels required for untreated materials.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties:
 - a. Modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 - 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties:
 - a. Modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
 - 3. Product: Subject to compliance with requirements, provide "Duraf Flake FR" by Weyerhaeuser.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
 - 1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section 08710.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.

- E. Adjustable Shelf Standards and Supports (inside cabinets): BHMA A156.9, B04071; with shelf rests, B04081.
- F. Adjustable Shelf Standards and Supports (open shelving): BHMA A156.9, B04102; with shelf brackets, B04112.
- G. Drawer Slides: BHMA A156.9, B05091.
 - 1. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 - 3. Box Drawer Slides: Grade 1; for drawers not more than 6 inches high and 24 inches wide.
 - 4. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches high or 24 inches wide.
 - 5. Pencil Drawer Slides: Grade 2; for drawers not more than 3 inches high and 24 inches wide.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide " SG series" by Doug Mockett & Company, Inc.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- B. Ornamental Railings: Refer to Section 05721.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
 - 1. Moisture content
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for

shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of varnish.
- G. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: FAS
- B. Wood Species and Cut: Red Oak.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.7 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Grade: FAS.
- B. Wood Species and Cut: Red Oak.
- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
- D. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 1. Fire Rating: 20 minutes.

2.8 FLUSH WOOD PANELING AND WAINSCOTS

- A. Grade: FAS.
- B. Wood Species and Cut: Red Oak.
- C. Matching of Adjacent Veneer Leaves: Slip match.
- D. Panel-Matching Method: Match panels within each separate area by the following method:
 1. Pre-manufactured sets used full width as indicated.
- E. Fire-Retardant-Treated Paneling: Provide panels consisting of wood veneer and fire-retardant particleboard or fire-retardant medium-density fiberboard. Panels shall have flame-spread index of 25 or less and smoke-developed index of 450 or less per ASTM E 84.

2.9 INTERIOR ORNAMENTAL WORK FOR TRANSPARENT FINISH

- A. Interior ornamental work for transparent finish includes the following:
 1. Refer to Schedule on Drawings.
- B. Grade: FAS.
- C. Wood Species and Cut: Red Oak.

- 2.10 WOOD CABINETS FOR TRANSPARENT FINISH
- A. Grade: FAS.
 - B. AWI Type of Cabinet Construction: Flush overlay.
 - C. Wood Species and Cut for Exposed Surfaces: Red oak, plain sawn.
 - 1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
 - 2. Matching of Veneer Leaves: Slip match.
 - D. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- 2.11 PLASTIC-LAMINATE CABINETS
- A. Grade: Custom.
 - B. AWI Type of Cabinet Construction: Flush overlay.
 - C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: Grade HGS.
 - D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Thermoset decorative panels.
 - 3. Drawer Bottoms: Thermoset decorative panels.
 - E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
 - F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations on Drawings.
 - G. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- 2.12 PLASTIC-LAMINATE COUNTERTOPS
- A. Grade: Custom.
 - B. High-Pressure Decorative Laminate Grade: HGS.
 - C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations. Refer to Schedule on Drawings.
 - D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
 - E. Core Material: Particleboard or medium-density fiberboard.
 - F. Core Material at Sinks: Medium-density fiberboard made with exterior glue or exterior-grade plywood.
 - G. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.
- 2.13 SOLID-SURFACING-MATERIAL COUNTERTOPS
- A. Refer to Section 06660.
- 2.14 CLOSET AND UTILITY SHELVING
- A. Grade: C or Better.

- B. Shelf Material: 3/4-inch solid lumber.
- C. Cleats: 3/4-inch solid lumber.
- D. Wood Species: Southern Yellow Pine.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- H. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless otherwise indicated.
 - 1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with toggle bolts through metal backing or metal framing behind wall finish.
- J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- L. Refer to Division 9 Sections for final finishing of installed architectural woodwork.
- 3.3 ADJUSTING AND CLEANING
- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate, and adjust hardware.
 - C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.
- 3.4 PLASTIC LAMINATE COLORS AS RELATED TO LOCATION:
- A. No substitutes permitted.
 - B. Plastic Laminate Surfaces:
 1. PLB - Wilson Art "Black", No. 1595-60.
 - a. Back bar display.
 - b. P.O.S. cabinets.
 - c. Service cabinets.
 - d. Hostess Stand
 2. PLW - Wilson Art "Designer White" No. D354-60.
 - a. Millwork in office and back of the house.
 3. Waterproof Glue:
 - a. As manufactured by Weldwood, Commercial Standards: C.S.-35, Type I.
 - b. Contact cement for bonding hi-pressure laminate: C.S.-35, Type II.

END OF SECTION 06402

SECTION 07141

FLUID APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. This document contains all the manufacturer's requirements for the proper design, use, and installation of the Fluid Applied Waterproofing. This document is intended to be used in conjunction with:
 - 1. Fluid Applied Waterproofing Application Instructions
 - 2. Fluid Applied Waterproofing Product Data Sheet
- B. Related Sections
 - 1. Unit Masonry – Section 04810
 - 2. Concrete – Sections 03300
 - 3. Wood Framing – Section 06100
 - 4. Sealant – Section 07920
 - 5. Flashing – Section 07620
 - 6. EIFS- Section 07240

1.2 REFERENCES

- A. Section Includes:
 - 1. ASTM C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
 - 2. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 3. ASTM C 1396 (formerly C 79) Standard Specification for Gypsum Board
 - 4. ASTM D 522 Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
 - 5. ASTM D 2370 Standard Test Method for Tensile Properties of Organic Coatings
 - 6. ASTM D 2247 (Federal Test Standard 141A Method 6201) Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
 - 7. ASTM E 72 Standard Methods for Conducting Strength Tests of Panels for Building Construction
 - 8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 9. ASTM E 96 Proc A Standard Test Methods for Water Vapor Transmission of Materials
 - 10. ASTM E 283 Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
 - 11. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
 - 12. ASTM E 1233 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclic Air Pressure Differential
 - 13. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials
 - 14. ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
 - 15. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
 - 16. ASTM E 2485 (formerly EIMA Std. 101.01) Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings
 - 17. ASTM E 2570 Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage

18. AATCC Test Method 127-2008 Water Resistance: Hydrostatic Pressure Test
19. Federal Specification TT-C-555B Resistance to Wind-Driven Rain

1.3 DEFINITIONS

- A. Contractor: The contractor that applies the Fluid Applied Waterproofing to the substrate.
- B. Sheathing: A substrate in sheet form.
- C. Substrate: The material to which the Fluid Applied Waterproofing is applied.
- D. Substrate System: The total wall assembly including the attached substrate to which the Fluid Applied Waterproofing is applied

1.4 DESCRIPTION

- A. Fluid Applied Waterproofing is a flexible polymer based, noncementitious, protective coating used as an air/vapor/water-resistive barrier when applied over acceptable substrates.
- B. Design Requirements
 1. Acceptable surfaces for Fluid Applied Waterproofing include:
 - a. Exterior grade gypsum sheathing meeting ASTM C 1396 (formerly C 79) requirements for water resistant core or Type X core at the time of application.
 - b. Exterior sheathing having a water-resistant core with fiberglass mat facers meeting ASTM C 1177.
 - c. Exterior fiber reinforced cement or calcium silicate boards.
 - d. APA Exterior or Exposure 1 Rated Plywood, Grade C-D or better, nominal **1/2 in** (12.7 mm) minimum, 4-ply, installed with the C face out.
 - e. APA Exterior Grade Fire Retardant Treated Plywood, nominal **1/2 in** (12.7 mm) minimum.
 - f. Unpainted, unsealed concrete and CMU.
 2. Fluid Applied Waterproofing is not intended to be used as waterproofing for exterior horizontal surfaces or below grade applications.
 3. Fluid Applied Waterproofing shall not be exposed to weather for longer than 30 days prior to being covered.
 4. Deflections of the substrate systems shall not exceed 1/240 times the span.
- C. Performance Requirements: Fluid Applied Waterproofing shall meet the following performance criteria:

Test	Test Method	Criteria	Results
Surface Burning Characteristics	ASTM E 84	ICC and ANSI/EIMA 99-A-2001 Flame Spread <25 Smoke Developed <450	Passed
Flexibility	ASTM D 522 Method B	No ICC or ANSI/EIMA Criteria	No cracking at 2 mm diameter
Water Vapor Transmission	ASTM E 96 Procedure A Dessicant Method	ICC: Class I Vapor Retarder Less than 0.1 Perms	0.088 Perms ²
Freeze-Thaw Resistance	ASTM E 2485/ICC-ES Procedure (AC212)*	ICC: 10 cycles No deleterious effects ¹	Passed - 10 cycles: No deleterious effects ¹
Water Resistance	ASTM D 2247 ICC ES (AC212)*	ICC: 14 days exposure No deleterious effects ¹	No deleterious effects ¹ after 14 days exposure
Tensile Strength and Elongation	ASTM D 2370	No ICC or ANSI/EIMA Criteria	Tensile strength: 160 psi Elongation: 16.8%
Wind Driven Rain	Fed TT-C-555	No ICC or ANSI/EIMA Criteria	No water penetration
Air Leakage	ASTM E 283	No ICC or ANSI/EIMA Criteria	0.01 l/sec/m ² (0.002 cfm/ft ²)
Air Permeance	ASTM E 2178	No ICC or ANSI/EIMA Criteria	0.0006 l/s/m ² @ 75Pa (1.2x10 ⁻⁴ cfm/ft ² @ 1.6 psf)
Air Barrier Assembly	ASTM E 2357	No ICC or ANSI/EIMA Criteria	0.05 l/sec m ² @300 Pa (<0.001 cfm/ft ² @ 6.24 psf)
Structural Performance	ASTM E 1233 Procedure A ICC ES (AC212)*	ICC: Minimum 10 positive cycles at 1/240 deflection; No cracking in field, at joints or interface with flashing.	Passed
Racking	ASTM E 72 ICC ES (AC212)*	ICC: No cracking in field, at joints or interface with flashing at net deflection of 3.2 mm (1/8 in)	Passed
Restrained Environmental	ICC-ES Procedure ICC ES (AC212)*	ICC: 5 cycles; No cracking in field; at joints or interface with flashing	Passed
Water Penetration	ASTM E 331 ICC ES (AC212)*	ICC: No water penetration beyond the inner-most plane of the wall after 15 minutes at 137 kPa (2.86 psf)	Passed 75 minutes at 299 Pa (6.24 psf)
Tensile Bond	ASTM C 297/E 2134 (formerly EIMA 101.03) ICC ES (AC212)*	ICC and ANSI/EIMA 99-A-2001 Minimum 104 kPa (15 psi)	Substrates: Minimum 131 kPa (19 psi) Flashing: Minimum 2970 kPa (431 psi)
Weathering UV Exposure	ICC ES Proc. ICC ES (AC212)*	ICC: 210 hours of exposure	Passed
Accelerated Aging	ICC ES Proc. ICC ES (AC212)*	ICC: 25 cycles of wetting and drying	Passed
Hydrostatic Pressure Test	AATCC 127 ICC ES (AC212)*	ICC: 549 mm (21.6 in) water column for 5 hours	Passed
<p>* (AC212 – Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570</p> <p>1. No cracking, checking, rusting, crazing, erosion, blistering, peeling, or delamination when viewed under 5x magnification</p> <p>2. Defined as a Class I vapor retarder per the 2009 IBC and IRC</p>			

1.5 SUBMITTALS

- A. Product Data – The contractor shall submit to the owner/architect manufacturer's product data sheets describing products that will be used on this project.
- B. Samples – As required for the specific Exterior Insulation and Finish System specified.

1.6 QUALITY ASSURANCE

A. Qualifications

1. System Manufacturer: To ensure proper interface, all components shall be produced or supplied by a single manufacturer or authorized distributor.
 - a. Materials shall be manufactured at a facility covered by a current ISO 9001:2008 and ISO 14001:2004 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
2. Contractor: Shall be experienced and competent in the waterproofing trade and application of liquid air and water-resistive barriers.

B. Certification

1. Fluid Applied Waterproofing shall be recognized for the intended use by the applicable building code(s).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered to the job site in the original, unopened packages with labels intact.
- B. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating. Questionable materials shall not be used.
- C. Materials shall be stored at the job site in a cool, dry location, out of direct sunlight, protected from inclement weather and other sources of damage. Minimum storage temperature shall be 40°F (4 °C).

1.8 PROJECT CONDITIONS

A. Environmental Requirements

1. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.
2. At the time of application of Fluid Applied Waterproofing, the minimum air and wall surface temperatures shall be 40 °F (4°C) and rising. These temperatures shall be maintained, with adequate air ventilation and circulation, for a minimum of 12 hours thereafter, or until the products are dry.

- B. Existing Conditions – The contractor shall have access to electric power, clean water, and a clean work area at the location where the Fluid Applied Waterproofing materials are to be applied.

1.9 SEQUENCING AND SCHEDULING

- A. Installation of the Fluid Applied Waterproofing shall be coordinated with other construction trades.

1.10 WARRANTIES

- A. The General Contractor shall provide a two (2) year labor warranty upon completion of installation. The Contractor shall follow manufacture recommendation for inspection and notification procedures for on-site application in order that the installation qualifies for warranty.
- B. The General Contractor shall provide the standard five (5) year manufacture recommendation for warranty for materials replacement. The Contractor shall follow manufacture recommendation for inspection and notification procedures for on-site application in order to assure that the installation qualifies for warranty.

PART 2 PRODUCT

2.1 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide Class PB system of one of the following:
 - 1. Dryvit Systems, Inc.
 - 2. Parex
 - 3. STO Industries, Inc.
- B. Basis for Design:
 - 1. Behind EIFS: Backstop NT [**Backstop NT-VB in Northern Climates**] as manufactured by Dryvit Systems, Inc.
 - 2. Behind All other exterior building materials: Tyvek Fluid Applied WB
 - 3. Transitional Flashing: Tyvek Straight Flash.
- C. Substitutions: Under provisions of Section 01600.

2.2 COMPONENTS

- A. Air/Vapor/Water-Resistive Barrier Components:
 - 1. Fluid Applied Waterproofing: A flexible, polymer-based, noncementitious, liquid applied barrier coating
 - 2. Joint Tape: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 4 in (102 mm) wide by 100 yds (91 m) long.
- B. Flashing Materials: Used to protect substrate edges at terminations.
 - 1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
 - 2. Sheet Type:
 - a. Shall be Flashing Tape and Surface Conditioner
 - 1) Flashing Tape: A high density polyethylene film backed with a rubberized asphalt adhesive available in rolls 12 in wide by 75 ft long.
 - 2) Flashing Tape Surface Conditioner: A water-based surface conditioner and adhesion promoter for the Flashing Tape.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to application of Fluid Applied Waterproofing the contractor shall verify that the substrate:
 - 1. Is of a type listed in Section 1.04.B.1.
 - 2. Is flat within 1/4 in (6.4 mm) in a 4 ft (1.2 m) radius.
 - 3. Gaps do not exceed 1/4 in (6.4 mm). Larger gaps shall be corrected by replacing sheathing material.
 - 4. Is sound, dry, connections are tight; has no surface voids, projections, or other conditions that may interfere with the application of Fluid Applied Waterproofing
- B. Ambient and surface temperatures are minimum 40 °F (4 °C) and rising.
- C. The contractor shall notify the general contractor and/or architect and/or owner of all discrepancies. Work shall not proceed until discrepancies have been corrected.

3.2 SURFACE PREPARATION

- A. The Fluid Applied Waterproofing materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
- B. Protect adjoining work and property during application of Fluid Applied Waterproofing.
- C. The substrate shall be prepared as to be free of foreign materials such as oil, dust, dirt, paint, wax, water repellents, moisture, frost and any other materials that inhibit adhesion.

3.3 INSTALLATION

- A. Fluid Applied Waterproofing

1. General: Fluid Applied Waterproofing shall be applied in accordance with current published Fluid Applied Waterproofing Application Instructions.
2. Fluid Applied Waterproofing is ready to use after an initial spin-up using a "Twister" paddle or equivalent mixing blade, powered by a 1/2 in (12.7 mm) drill, at 450 – 500 rpm. Do not add cement or any other additive.
3. Apply a strip of Joint Tape over all sheathing joints, including inside and outside corners and trowel apply a layer of Fluid Applied Waterproofing over the Joint Tape.
4. Depending on the substrate, Fluid Applied Waterproofing may be applied using a trowel, roller, or spray equipment and backrolled. Refer to Fluid Applied Waterproofing Application Instructions.
5. Apply Fluid Applied Waterproofing over the entire wall surface, including previously treated joints. Refer to the chart on the Fluid Applied Waterproofing Product Data Sheet, or Application Instructions, for proper tools and respective coverage. A minimum 2 coats of Fluid Applied Waterproofing are required.
6. Allow to dry a minimum of 4 hours prior to application of Flashing or Flashing Tape and adhesively applied EPS insulation board. Cool damp weather will require longer drying times. During cool damp weather, Flashing Tape Surface Conditioner may be necessary for proper Flashing Tape adhesion.
7. Install 12" wide min. transitional flashing. Overlap first coat of fluid applied WB a min. 6". Roll on adjacent fluid applied WB and overlap transitional flashing a min. of 6"
8. Install the specified cladding or Exterior Insulation and Finish System per published installation instructions for the specific system being used.

3.4 FIELD QUALITY CONTROL

- A. The contractor shall be responsible for the proper application of materials.

3.5 CLEANING

- A. All excess materials shall be removed from the job site by the Contractor in accordance with contract provisions.
- B. All surrounding areas, where materials have been installed, shall be left free of debris and foreign substances resulting from the Contractor's work.

3.6 PROTECTION

- A. The Fluid Applied Waterproofing materials and the project shall be protected from damage and inclement weather until dry.
 1. The Fluid Applied Waterproofing shall not be exposed for longer than 30 days prior to being covered with the specified cladding

END OF SECTION

SECTION 07143

PREFORMED METAL WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preformed, prefinished metal wall panels and flashings.
 - 2. Miscellaneous trim, flashing, closures and accessories.
 - 3. Fastening devices.

1.2 RELATED SECTIONS:

- A. Section 05120: Structural Steel Framing.
- B. Section 05500: Miscellaneous metal fabrication.
- C. Section 06100: Rough Carpentry.
- D. Section 07631: Flashing.

1.3 REFERENCES

- A. American Iron & Steel Institute (AISI) Specification for the Design of Cold-formed Steel Structural Members.
- B. ASTM A-525 Steel Sheet, Zinc-Coated (Galvanized).
- C. SMACNA - Architectural Sheet Metal Manual.

1.4 ASSEMBLY DESCRIPTION

- A. The wall assembly includes preformed sheet metal panels, related accessories, miscellaneous flashing and attaching devices.

1.5 SUBMITTALS

- A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
- B. Submit a sample of each type of wall panel, complete with factory finish.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.
- B. No product substitutions shall be permitted without meeting specifications.
- C. Substitutions shall be submitted 10 Days prior to Bid Date and acceptance put forth in an addendum.
- D. No substitutions shall be made after the Bid Date.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.
- C. Panels with strippable film must not be stored in the open, exposed to the sun.
- D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.8 WARRANTY

- A. Paint finish shall have a (20) twenty year warranty against cracking, peeling and fade (not to exceed 5 N.B.S. units).
- B. Galvalume material shall have a (20) twenty year warranty against failure due to corrosion, rupture or perforation
- C. Applicator shall furnish warranty covering watertightness of the wall system for the period of two (2) years from the date of substantial completion.

PART 2 PRODUCT

2.1 ACCEPTABLE MANUFACTURERS

- A. Berridge Manufacturing Company, Houston, Texas.
- B. Substitutions: Under provisions of Section 01600.

2.2 SHEET MATERIALS

- A. Prefinished metal shall be Aluminum-Zinc Alloy Coated (AZ-55 Galvalume®) Steel Sheet, 22-Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi min.
- B. Finish shall be full strength Kynar 500® or Hylar 5000™ fluoropolymer coating applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil over 0.20 ± 0.05 mil prime coat, to provide a total top side dry film thickness of 0.95 ± 0.10 mil. Bottom side shall be coated with a primer and beige urethane coating with a total dry film thickness of 0.35 ± 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500® or Hylar 5000™ finish supplier.
- C. Color shall be as noted in the drawings.
- D. Strippable film shall be applied to the top side of all prefinished metal to protect the finish during fabrication, shipping and field handling. This strippable film MUST be removed immediately before installation.
- E. Unpainted metal shall be Aluminum-Zinc Alloy Coated (AZ-55 Acrylic Coated Galvalume®) Steel Sheet, 22-Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi min., with clear acrylic coating on both sides of material.
- F. Field protection must be provided by the contractor at the job site so stacked or coiled material is not exposed to weather and moisture.
- G. Flashing may be factory fabricated or field fabricated. Unless otherwise specified all exposed adjacent flashing shall be of the same material and finish as panel system.

2.3 ACCESSORY MATERIALS

- A. Concealed fasteners: Galvanized Steel.

2.4 FABRICATION

- A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.5 PREFORMED WALL PANELS

- A. BERRIDGE HR-16 WALL PANEL
 - 1. Panel coverage width to be 16", with a panel depth of 7/8".
 - 2. Ribs to be spaced 4" on center.
 - 3. Panels to be of interlocking design with concealed fasteners.

PART 3 EXECUTION

3.1 INSPECTION

- A. Substrate:
 - 1. Minimum 1/2" plywood, 24-gauge metal deck or open-framed purlins at 4' o.c.
 - 2. Inspect framing to verify free of depressions, waves or projections, level to 1/4" in 20'.
 - 3. Verify openings, curbs, pipes, sleeves, ducts or vents through wall are solidly set.

3.2 INSTALLATION

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
- B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
- C. Remove protective strippable film prior to installation of panels.
- D. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- E. Do not allow panels or trim to come into contact with dissimilar materials.
- F. Remove and replace any panels or components which are damaged beyond successful repair.

3.3 CLEANING

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.

3.4 FINAL INSPECTION

- A. Final inspection will be performed by a firm appointed and paid for by the owner in accordance with section 01410.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Rigid insulation.
 - 2. Semi-rigid insulation.
 - 3. Batt and blanket insulation.
 - 4. Installation accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide continuity of thermal barrier at building enclosure elements.
- B. Provide continuity of vapor and air barrier at building enclosure elements.

1.3 SUBMITTALS

- A. General: Submit following items under provisions of Section 01330.
- B. Product Data: Including performance specifications, composition, and applicable standards.
- C. Manufacturer's Instructions: Written installation instructions including attachment recommendations.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle, and protect products under provisions of Section 01600.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation during inclement weather or when surfaces are moist.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate work in accordance with Section 01310.
- B. Do not begin work until substrate work is complete and work of other trades that will be concealed by work of this Section has been approved.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following. Refer to Articles below for specific products.
 - 1. Johns Manville, Denver, CO.
 - 2. United States Gypsum Co., Chicago, IL.
 - 3. Owens Corning Fiberglas Corp., Toledo, OH.
 - 4. Fibrex Co., Aurora, IL.
 - 5. Certaineed Corp., Valley Forge, PA.
 - 6. Dow Chemical
- B. Substitutions: Submit in accordance with Section 01600.

2.2 RIGID BOARD, INSULATION TYPE 1

- A. Polystyrene Insulation: Extruded cellular type, meeting the following:
 - 1. ASTM C 578, Type VI.

2. Aged Thermal Resistance: R-value of 5.0 per inch thickness.
 3. Compressive Strength: 40 psi.
 4. Water Absorption: 0.3 percent maximum per ASI/ASTM D 2842.
 5. Edges: Square.
- B. Acceptable Products:
1. Styrofoam HighLoad 40 by Dow.
- 2.3 THERMAL BATT, INSULATION TYPE 2
- A. Glass fiber composition with fire retardant vapor barrier, minimum one pound per cubic foot density, meeting following standards:
1. ASTM E 84: FHC 25/50 maximum.
 2. ASTM C 518: R-value of 3.6 per inch of thickness.
 3. ASTM C 665: Type II, Class A.
- B. Acceptable Products:
1. Smartbatt by Certainteed Corp.
 2. ComfortTherm by Johns Manville.
- 2.4 THERMAL BATT, INSULATION TYPE 3
- A. Unfaced glass fiber composition minimum 1 pound per cubic foot density, meeting following standards:
1. ASTM E 84: Flame spread 25 maximum; smoke developed 50 maximum.
 2. ASTM E 136: Non-combustible.
 3. ASTM C 518: R-value of 3.2 per inch of thickness.
 4. ASTM C 665: Type I.
- B. Acceptable Products:
1. Unfaced Thermal Batt Insulation by Owens Corning Fiberglas Corp.
 2. Unfaced Thermal Batt Insulation by Certainteed Corp.
 3. Unfaced Thermal-SHIELD by Johns Manville.
- 2.5 ACCESSORIES
- A. Joint Tape: Pressure sensitive type, recommended by insulation manufacturer.
- B. Insulation Adhesive: Type recommended by insulation manufacturer.

PART 3 EXECUTION

- 3.1 EXAMINATION
- A. Verify that substrates and conditions are ready to receive work of this Section. Notify Construction Manager of any existing conditions that will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.
- B. Verify that work of other trades that will be covered by insulation in complete and approved.
- 3.2 BATT AND BLANKET INSTALLATION
- A. Install insulation either friction fit, using adhesive, or using mechanical fasteners in accordance with manufacturer's recommendations after mechanical and electrical services have been installed.
- B. Fit insulation tight within stud spaces, above soffits, behind facias, and tight to and behind mechanical and electric services within plane of insulation, leaving no gaps or voids. Butt insulation tightly. Cut and fit tightly around items penetrating insulation. Stagger and butt joints, or cavity of a cavity wall system.
- C. Within metal stud or joist systems install full height and width in such manner that voids or openings do not occur. Insulation is required for full width between studs, including cavity of each stud. Do not allow insulation to obstruct vents.
- D. Cut and trim insulation neatly, to fit spaces. Cut insulation oversize to ensure tight butt joints when installed. Cut insulation to fit around protrusions and irregularly shaped projections. Use batts free of ripped backs or edges.

- E. Batt Insulation with Vapor Barrier Membrane
 - 1. Install insulation with factory applied membrane facing warm in winter side of building spaces.
 - 2. Lap ends and side flanges of membrane over framing members; fasten in place at maximum 6 inches on center or tape in place.
 - 3. Tape seal butt ends; lap side flanges and ends; do not tear membrane.
- F. Install sound attenuating blankets above ceilings and in stud cavities where detailed or scheduled. Butt tightly.

3.3 RIGID BOARD INSTALLATION –FOUNDATION PERIMETER AND UNDER SLAB

- A. Install in strict accordance with the manufacturer's printed instructions for the specific product.
- B. Place rigid insulation at perimeter of exterior spaces.
- C. Install boards on foundation perimeter, horizontally. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.
- D. Extend boards over control and expansion joints, unbonded to foundation 6 inches either side of joint.
- E. Extend insulation from underside of interior slab to 4'-0" below exterior finish grade or to top of footing, whichever occurs first.
- F. Place foundation insulation boards specified over areas and against foundation walls as shown on the Drawings and specified herein. Adhere boards to surfaces with adhesive using spot method or ribbon application as specified herein. Place insulation boards with closely butted joints over the entire area to be insulated.
- G. Adhesive Application; one of following:
 - 1. Spot Method: Apply walnut size spots of adhesive, approximately 1 inch diameter by 3/4 inch high, located 8 inches to 12 inches on center alternately spaced beginning at a corner of the board. Use larger spots to compensate for uneven or irregular wall surfaces. Install board within time limit allowed by the adhesive.
 - 2. Ribbon Application Method: Using mechanical applicator, such as hand caulking gun or pneumatic dispenser, extrude ribbons 6 inches in length, 12 inches on center the full length of board. Apply 3 lines of ribbons on board, 1 along centerline and the other 2 approximately 3 inches in from the long edge. Provide minimum 5/16-inch diameter ribbons. Install board within the time limit allowed by the adhesive.
- H. Place under-slab insulation boards over areas shown on Drawings and specified herein. For detailed thicknesses over 2 inches, install insulation boards in 2 layers with joints of each layer closely butted and joints staggered between layers over the entire area to be insulated.

3.4 PROTECTION

- A. Protect insulation from moisture until building is made watertight.

3.5 SCHEDULES

- A. Foundation and Under Slab: Type 1, minimum 2 inches thick. Refer to Drawings.
- B. Exterior Walls at Metal Studs: Type 2.
 - 1. Minimum R-20 required at 5-1/2 inch studs.
- C. Acoustical Insulation, Interior Walls: Type 3, minimum 3-1/2 inches thick. Also refer to Section 09250.
 - 1. Provide in walls surrounding the kitchen and toilet rooms, and elsewhere as noted on the Drawings.
- D. Roof Insulation: Refer to Section 07540.

END OF SECTION

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEM

PART I GENERAL

1.1 SUMMARY

- A. Provide and install exterior wall insulation and finish system as shown on the Drawings and specified herein.
- B. Related Sections
 - 1. Unit Masonry – Section 04810
 - 2. Concrete – Sections 03300
 - 3. Wood Framing – Section 06100
 - 4. Sealant – Section 07920
 - 5. Flashing – Section 07620

1.2 REFERENCES

- A. Section Includes
 - 1. ASTM B 117 (Federal Test Standard 141A Method 6061) Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 2. ASTM C 150 Standard Specification for Portland Cement
 - 3. ASTM C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
 - 4. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 5. ASTM C 1396 (formerly C 79) Standard Specification for Gypsum Board
 - 6. ASTM D 968 (Federal Test Standard 141A Method 6191) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
 - 7. ASTM D 2247 (Federal Test Standard 141A Method 6201) Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
 - 8. ASTM D 2898 Standard Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
 - 9. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 - 10. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
 - 11. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 12. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
 - 13. ASTM E 119 Standard Method for Fire Tests of Building Construction and Materials
 - 14. ASTM E 283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
 - 15. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Doors and Curtain Walls by Uniform Static Air Pressure Difference
 - 16. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
 - 17. ASTM E 2098 Test Method for Determining the Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to Sodium Hydroxide Solution
 - 18. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
 - 19. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials

20. ASTM E 2273 Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies
21. ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
22. ASTM E 2430 Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish Systems (EIFS)
23. ASTM E 2485 (formerly EIMA Std. 101.01) Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings
24. ASTM E 2486 (formerly EIMA Std. 101.86) Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
23. ASTM E 2568 Standard Specification for PE Exterior Insulation and Finish Systems
24. ASTM E 2570 Standard Test Method for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage
25. ASTM G 155 (Federal Test Standard 141A Method 6151) Standard Practice for Operating-Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials
26. Mil Std E5272 Environmental Testing
27. Mil Std 810B Environmental Test Methods
28. NFPA 268 Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
29. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus

1.3 DEFINITIONS

- A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.
- B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.
- C. Contractor: The contractor that installs the exterior insulation and finish system to the substrate.
- D. Expansion Joint: A structural discontinuity in the Exterior insulation and finish system.
- E. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.
- F. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate and creates a layer of continuous insulation.
- G. Panel Erector: The contractor who installs the panelized exterior insulation and finish system.
- H. Panel Fabricator: The contractor who fabricates the panelized exterior insulation and finish system.
- I. Reinforcing Mesh: Glass fiber mesh(es) used to reinforce the base coat and to provide impact resistance.
- J. Sheathing: A substrate in sheet form.
- K. Substrate: The material to which the exterior insulation and finish system is affixed.
- L. Substrate System: The total wall assembly including the attached substrate to which the exterior insulation and finish system is affixed.

1.4 SYSTEM DESCRIPTION

- A. General: The exterior insulation and finish system is an Exterior Insulation and Finish System (EIFS), Class PB, with capability for moisture drainage. The system consists of an air/water-resistive barrier coating, an adhesive, grooved expanded polystyrene insulation board, internal vinyl tracks, vent assemblies, starter strip, base coat, reinforcing mesh(es) and finish.
- B. Methods of Installation
 1. Field Applied: The Exterior insulation and finish system is applied to the substrate system in place.

C. Design Requirements:

1. Acceptable substrates for the Exterior insulation and finish system shall be:
 - a. APA Exterior or Exposure 1 Rated Plywood, Grade C-D or better, nominal 13 mm (1/2 in) minimum 4-ply.
 - b. Exterior grade fire retardant treated (FRT) plywood, where required by code.
2. Deflection of the substrate systems shall not exceed 1/240 times the span.
3. The substrate shall be flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
4. The slope of inclined surfaces shall not be less than 6:12, and the length shall not exceed 12" (305 mm).
5. All areas requiring an impact resistance classification higher than "standard", as defined by ASTM E 2486 (formerly EIMA Standard 101.86), shall be as detailed in the drawings and described in the contract documents. Refer to Section 1.4.D.1.d of this specification.
6. Expansion Joints:
 - a. As noted in the drawings. As a minimum, expansion joints shall be placed at the following locations:
 - 1) Where expansion joints occur in the substrate system.
 - 2) Where building expansion joints occur.
 - 3) At floor lines in wood frame construction.
 - 4) At floor lines of non-wood framed buildings where significant movement is expected.
 - 5) Where the Exterior insulation and finish system abuts dissimilar materials.
 - 6) Where the substrate type changes.
 - 7) Where prefabricated panels abut one another.
 - 8) In continuous elevations at intervals not exceeding 23 m (75 ft).
 - 9) Where significant structural movement occurs, such as changes in roof line, building shape or structural system.
7. Terminations
 - a. Prior to applying the exterior insulation and finish system, wall openings shall be treated with an approved flashing system or flashing tape.
 - b. The Exterior insulation and finish system shall be held back from adjoining materials around openings and penetrations such as windows, doors, and mechanical equipment a minimum of 3/4 in (19 mm) for sealant application.
 - c. The system shall be terminated a minimum of 8 in (203 mm) above finished grade.
 - d. Sealants
 - 1) Shall be manufactured and supplied by others.
 - 2) Shall be compatible with the Exterior insulation and finish system materials.
 - 3) The sealant backer rod shall be closed cell.
8. Vapor Retarders: As noted in drawings.
9. Flashing: Shall be provided at all roof-wall intersections, windows, doors, chimneys, decks, balconies and other areas as necessary to prevent water from entering behind the Exterior insulation and finish system.

D. Performance Requirements:

1. The Exterior insulation and finish system shall have been tested as follows:
 - a. Air/Water-Resistive Barrier Coating

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134 ICC ES (AC 212)*	Minimum 104 kPa (15 psi)	Substrate: Min. 131 kPa (19 psi) (Backstop NT) Min. 106 kPa (15.4 psi) (Backstop DMS) Flashing: Min 2970 kPa (431 psi) (Backstop NT) Min. 967 kPa (140 psi) (Backstop DMS)
Freeze-thaw	ASTM E 2485/ICC-ES Proc. ICC ES (AC 212)*	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles
Water Resistance	ASTM D 2247 ICC ES (AC 212)*	No deleterious effects after 14 days exposure ¹	No deleterious effects after 14 days exposure
Water Vapor Transmission	ASTM E 96 Proc. B ICC ES (AC 212)*	Vapor Permeable	7 perms (Backstop NT) ² 20 perms (Backstop DMS)
Air Leakage	ASTM E 283	No ICC or ANSI/EIMA Criteria	0.01 l/sec/m ² (0.002 cfm/ft ²) (Backstop NT)
Air Permeance	ASTM E 2178	No ICC or ANSI/EIMA Criteria	0.0006 l/s/m ² @ 75Pa (1.2x10 ⁻⁴ cfm/ft ² @ 1.6 psf) (Backstop NT)
Air Barrier Assembly	ASTM E 2357	No ICC or ANSI/EIMA Criteria	0.05 l/sec m ² @ 300 Pa (<0.001 cfm/ft ² @ 6.24 psf) (Backstop NT)

Structural Performance	ASTM E 1233 Proc. A ICC ES (AC 212)*	Minimum 10 positive cycles at 1/240 deflection; No cracking in field, at joints or interface with flashing	Passed
Racking	ASTM E 72 ICC ES (AC 212)*	No cracking in field, at joints or interface with flashing at net deflection of 3.2 mm (1/8 inch)	Passed
Restrained Environmental	ICC-ES Procedure ICC ES (AC 212)*	5 cycles; No cracking in field, at joints or interface with flashing	Passed
Water Penetration	ASTM E 331 ICC ES (AC 212)*	No water penetration beyond the inner-most plane of the wall after 15 minutes at 137 Pa (2.86 psf)	Passed
Weathering UV Exposure	ICC ES Proc. ICC ES (AC 212)*	210 hours of exposure	Passed
Accelerated Aging	ICC ES Proc. ICC ES (AC 212)*	25 cycles of wetting and drying	Passed
Hydrostatic Pressure Test	AATCC 127 ICC ES (AC 212)*	ICC: 549 mm (21.6 in) water column for 5 hours	Passed
Surface Burning Characteristics	ASTM E 84	Flame Spread < 25 Smoke Developed < 450	Passed
<p>* (AC212 – Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing, also referred to as ASTM E 2570</p> <ol style="list-style-type: none"> 1. No cracking, checking, rusting, crazing, erosion, blistering, peeling, or delamination when viewed under 5x magnification 2. Defined as a Class III vapor retarder per the 2009 IBC and IRC 			

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed - No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed - No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc. ICC ES (AC 235)***	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period
Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 235)***	No water penetration beyond the inner-most plane of the wall after 15 minutes at 137 Pa (2.86 psf)	Passed 15 minutes at 137 Pa (2.86 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
Drainage Efficiency	ASTM E 2273 ICC ES (AC 235)***	Minimum Drainage Efficiency of 90%	Passed

* Base Coat perm value based on Dryvit Genesis®
** Finish perm value based on Dryvit Quarzputz
*** AC 235 (ASTM E 2568) – Acceptance Criteria for EIFS Clad Drainage Wall Assemblies

c. Structural

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134	Minimum 104 kPa (15 psi) – substrate or insulation failure	Minimum 213.6 kPa (31 psi)
Transverse Wind Load	ASTM E 330	Withstand positive and negative wind loads as specified by the building code	Minimum 4.3 kPa (90 psf)* 16 inch o.c. framing, ½ in sheathing screw attached at 203 mm (8 inch) o.c.

* All Dryvit components remain intact – for higher wind loads contact Dryvit Systems, Inc.

d. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86):

Reinforcing Mesh/Weight g/m ² (oz/yd ²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range		Impact Test Results	
			Joules	(in-lbs)	Joules	(in-lbs)
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus - 203 (6)	36 g/cm (200 lbs/in).	Medium	6-10	(50-89)	6	(56)
Intermediate™ - 407 (12)	54 g/cm (300	High	10-17	(90-150)	12	(108)
Panzer® 15* - 509 (15)	71 g/cm (400	Ultra High	>17	(>150)	18	(162)
Panzer 20* - 695 (20.5)	98 g/cm (550	Ultra High	>17	(>150)	40	(352)
Detail Mesh® Short Rolls	27 g/cm (150	n/a	n/a	n/a	n/a	n/a
Corner Mesh - 244 (7.2)	49 g/cm (274	n/a	n/a	n/a	n/a	n/a

*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic).

e. Fire performance

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m ² at 20 minutes	Passed
Intermediate Multi-Story Fire Test	NFPA 285 (UBC 26-9)	<ol style="list-style-type: none"> 1. Resist flame propagation over the exterior surface 2. Resist vertical spread of flame within combustible core/component of panel from one story to the next 3. Resist vertical spread of flame over the interior surface from one story to the next 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces 	Passed

2. The exterior insulation and finish system components shall be tested for:
a. Fire

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread ≤ 25 Smoke Developed ≤ 450	Passed

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh Alkali Resistance of Reinforcing Mesh	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed
EPS (Physical Properties) Density	ASTM C 303, D 1622	15.2-20.0 kg/m ³ (0.95-1.25 lb/ft ³)	Pass
Thermal Resistance	ASTM C 177, C 518	4.0 @ 4.4 °C (40 °F)	Pass
Water Absorption		3.6 @ 23.9 °C (75 °F) 2.5 % max. by volume	Pass

Oxygen Index	ASTM C 272	24% min. by volume	Pass
Compressive Strength	ASTM D 2863	69 kPa (10 psi) min.	Pass
Flexural Strength	ASTM D 1621 Proc.	172 kPa (25 psi) min.	Pass
Flame Spread	A	25 max.	Pass
Smoke Developed	ASTM C 203	450 max.	Pass
	ASTM E 84		

1.5 SUBMITTALS

- A. Product Data: The contractor shall submit to the owner/architect the manufacturer's product data sheets describing products, which will be used on this project.
- B. Samples: The contractor shall submit to the owner/architect two (2) samples of the Exterior insulation and finish system for each finish, texture and color to be used on the project. The same tools and techniques proposed for the actual installation shall be used. Samples shall be of sufficient size to accurately represent each color and texture being utilized on the project.
- C. Test Reports: The contractor shall submit to the owner/architect copies of selected test reports verifying the performance of the Exterior insulation and finish system.

1.6 QUALITY ASSURANCE

A. Qualifications

- 1. System Manufacturer: To ensure proper interface, all components shall be produced or supplied by a single manufacturer or authorized distributor.
 - a. Materials shall be manufactured at a facility covered by a current ISO 9001:2008 and ISO 14001:2004 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
- 2. Contractor: Shall be knowledgeable in the proper installation of the system and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems. Additionally, the contractor shall possess a current system's manufacturer Trained Contractor Certificate* issued by the manufacturer.
- 3. Insulation Board Manufacturer: Shall be a system approved manufacturer and be capable of producing the expanded polystyrene (EPS) in accordance with the current Specification for Insulation Board, and shall subscribe to the system's Certification and Quality Assurance Program(s).
- 4. Panel Fabricator: Shall be a contractor experienced and competent in the fabrication of architectural wall panels and shall possess a current system's manufacturer Trained Contractor Certificate* issued by the manufacturer.
- 5. Panel Erector: Shall be experienced and competent in the installation of architectural wall panel systems and shall be:
 - a. The panel fabricator or
 - b. An erector approved by the panel fabricator or
 - c. An erector under the direct supervision of the panel fabricator

B. Regulatory Requirements:

- 1. The EPS shall be separated from the interior of the building by a minimum 15-minute thermal barrier.
- 2. The use and maximum thickness of EPS shall be in accordance with the applicable building codes.

C. Certification

- 1. The Exterior insulation and finish system shall be recognized for the intended use by the applicable building code(s).

D. Mock-Up

- 1. The contractor shall, before the project commences, provide the owner/architect with a mock-up for approval.

2. The mock-up shall be of suitable size as required to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
3. The mock-up shall be prepared with the same products, tools, equipment and techniques required for the actual applications. The finish used shall be from the same batch that is being used on the project.
4. The approved mock-up shall be available and maintained at the jobsite.
5. For panelized construction, the mock-up shall be available and maintained at the panel fabrication location.

1.7 DELIVERY, STORAGE AND HANDLING

- A. All exterior insulation and finish system materials shall be delivered to the job site in the original, unopened packages with labels intact.
- B. Upon arrival, materials shall be inspected for physical damage, freezing or overheating. Questionable materials shall not be used.
 1. Materials shall be stored at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other sources of damage. Minimum storage temperature shall be as recommended by the system manufacturer
 2. Maximum storage temperature shall not exceed 100 °F (38 °C). **NOTE: Minimize exposure of materials to temperatures over 90 °F (32 °C). Finishes exposed to temperatures over 110 °F (43 °C) for even short periods may exhibit skinning, increased viscosity and should be inspected prior to use.**
- C. Protect all products from inclement weather and direct sunlight.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements
 1. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.
 2. At the time of application, the minimum air and wall surface temperatures shall be as recommended by the system manufacturer.
 3. These temperatures shall be maintained with adequate air ventilation and circulation for a minimum of 24 hours thereafter, or until the products are completely dry. Refer to published product data sheets for more specific information.
- B. Existing Conditions: The contractor shall have access to electric power, clean water and a clean work area at the location where the exterior insulation and finish system materials are to be applied.

1.9 SEQUENCING AND SCHEDULING

- A. Installation of the Exterior insulation and finish system shall be coordinated with other construction trades.
- B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

1.10 WARRANTIES

- A. The General Contractor shall provide a two (2) year labor warranty upon completion of installation. The Contractor shall follow manufacture recommendation for inspection and notification procedures for on-site application in order that the installation qualifies for warranty.
- B. The General Contractor shall provide the standard five (5) year manufacture recommendation for warranty for materials replacement. The Contractor shall follow manufacturer recommendation for inspection and notification procedures for on-site application in order to assure that the installation qualifies for warranty.

1.12 MAINTENANCE

- A. Maintenance and repair shall follow the procedures noted in the Exterior insulation and finish system manufacturers Application Instructions.
- B. Sealants and flashings shall be inspected on a regular basis and repairs made as necessary.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Class PB systems that may be incorporated in the work included but are not limited to the following:
- B. Manufacturers: Subject to compliance with requirements, provide Class PB system of one of the following:
 - 1. Dryvit Systems, Inc.
 - 2. Parex
 - 3. STO Industries, Inc.
- C. Basis for Design: Outsulation MD as manufactured by Dryvit Systems, Inc.
- D. Substitutions: No Substitutions Allowed.

2.2 MATERIALS

- A. Portland Cement: Shall be Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.
- B. Water: Shall be clean and free of foreign matter.

2.3 COMPONENTS

- A. Air/Water-Resistive Barrier Components
 - 1. A flexible, polymer-based, noncementitious water-resistive coating and air barrier available in Texture and Smooth.
 - 2. Tape: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 4 in (102 mm) wide by 100 yds (91m) long.
- B. Flashing Materials: Used to protect substrate edges at terminations.
 - 1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
 - 2. Sheet Type:
 - a. Shall be Flashing Tape and Surface Conditioner
 - 1) Flashing Tape: A high density, polyethylene film backed with a rubberized asphalt adhesive available in rolls 102 mm (4 in), 152 mm (6 in) and 229 mm (9 in) wide by 23 m (75 ft) long.
 - 2) Surface Conditioner: A water-based surface conditioner and adhesion promoter for the Flashing Tape.
- C. Adhesives: Used to adhere the EPS to the air/water-resistive barrier, shall be compatible with the air/water-resistive barrier and the EPS.
 - 1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement.
 - 2. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
- D. Insulation Board: Expanded Polystyrene meeting Manufacturers Specification for Insulation Board.
 - 1. Thickness of insulation board shall be minimum 2 in. (51 mm).
 - 2. The back side of the insulation board shall have 1/4 in x 1 in (6.4 mm x 25 mm) grooves running vertically and spaced 12 in (305 mm) on center.
 - 3. The insulation board shall be manufactured by a board supplier listed by the manufacturer.
- E. Insulation Board Closure Blocks: Expanded Polystyrene meeting Manufacturers Specification for Insulation Board. The Closure Blocks shall measure a minimum of 6 in (152 mm) in height.
- F. Starter Strip

1. A 2 in x 6 in x 4 ft (51 mm x 152 mm x 1.2 m) piece of aged expanded polystyrene configured to receive the Starter Track and Vent Track. It is required at the base of all walls, at base of horizontal terminations, and heads of windows and other openings.
- G. Vent Assembly:
1. A 2 in x 6 in x 12 in (51 mm x 152 mm x 305 mm) piece of aged expanded polystyrene, which is configured to contain a formed aggregate matrix material and receive the Vent Track. It is required at the base of walls and the base of horizontal terminations and is capable of draining water.
- H. Adhesive: A moisture cure urethane-based adhesive used to attach the Starter Track and Vent Track.
- I. Starter Track:
1. A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 located above the Starter Strip.
- J. Vent Track:
1. A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 containing a slot for drainage and located above the Vent Assembly, along the base of walls and horizontal terminations.
- K. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement.
 2. Noncementitious: A factory-mixed, fully formulated, water-based product.
 3. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
- L. Reinforcing Mesh: A balanced, open weave, glass fiber fabric treated for compatibility with other system materials. **NOTE: Reinforcing meshes are classified by impact resistance and specified by weight and tensile strength as listed in Section 1.4.D.1.d.**
1. Shall be Standard, Standard Plus, Intermediate, Panzer 15, Panzer 20, Detail and Corner Mesh
 2. Shall be colored blue for product identification bearing the manufacturers logo.
- M. Finish: As noted in the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to installation of the Exterior insulation and finish system, the contractor shall verify that the substrate:
1. Is of a type listed in Section 1.4.C.1.
 2. Is flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
 3. Is sound, dry, connections are tight; has no surface voids, projections, or other conditions that may interfere with the Exterior insulation and finish system installation or performance.
- B. Prior to installation of the Exterior insulation and finish system the general contractor shall insure that all needed flashings and other waterproofing details have been completed. Additionally, the contractor shall ensure that:
1. Metal roof flashing has been installed in accordance with NRCA's "The NRCA Roofing and Waterproofing Manual" Standards.
 2. Openings are flashed in accordance with the Exterior insulation and finish system manufacturer's Installation Details, or as otherwise necessary to prevent water penetration.
 3. Chimneys, Balconies and Decks have been properly flashed.
 4. Windows, Doors, etc. are installed and flashed per manufacturer's requirements and the Exterior insulation and finish system manufacturer's Installation Details.
- C. Prior to the installation of the Exterior insulation and finish system, the contractor shall notify the general contractor, and/or architect, and/or owner of all discrepancies.

3.2 PREPARATION

- A. The exterior insulation and finish system materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
- B. Protect adjoining work and property during exterior insulation and finish system installation.
- C. The substrate shall be prepared as to be free of foreign materials, such as oil, dust, dirt, form-release agents, efflorescence, paint, wax, water repellants, moisture, frost, and any other condition that may inhibit adhesion.

3.3 INSTALLATION

- A. The system shall be installed in accordance with the Exterior insulation and finish system manufacturer's Application Instructions.
- B. The overall minimum base coat thickness shall be sufficient to fully embed the mesh. The recommended method is to apply the base coat in two (2) passes.
- C. Sealant shall not be applied directly to textured finishes or base coat surfaces. Exterior insulation and finish system surfaces in contact with sealant shall be coated with a Color Prime.
- D. High impact meshes shall be installed up to 4'-0" at ground level, high traffic areas and other areas exposed to or susceptible to impact damage.

3.4 FIELD QUALITY CONTROL

- A. The contractor shall be responsible for the proper application of the exterior insulation and finish system materials.
- B. The contractor shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures, workmanship and as to the specific products used.
- C. The EPS supplier shall certify in writing that the EPS meets exterior insulation and finish system manufacturers specifications.
- D. The sealant contractor shall certify in writing that the sealant application is in accordance with the sealant manufacturer's and exterior insulation and finish system manufacturers recommendations.

3.5 CLEANING

- A. All excess Exterior insulation and finish system materials shall be removed from the job site by the contractor in accordance with contract provisions and as required by applicable law.
- B. All surrounding areas, where the Exterior insulation and finish system has been applied, shall be left free of debris and foreign substances resulting from the contractor's work.

3.6 PROTECTION

- A. The Exterior insulation and finish system shall be protected from inclement weather and other sources of damage until dry and permanent protection in the form of flashings, sealants, etc. are installed.

END OF SECTION

SECTION 07460

FIBER CEMENT PANELS

PART 1 GENERAL

1.1 SCOPE

- A. Furnish and install fiber cement panels where shown on drawings or specified herein.

1.2 RELATED SECTIONS

- A. Division 06 - Wood and plastics.
- B. Section 05120 and 05400 - Steel framing and bracing.
- C. Section 07210 - Insulation.
- D. Section 07920 - Sealants, caulking and seals.

1.3 REFERENCES

- A. ASTM C1185, Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement Flat Sheet, Roofing and Siding, Shingles, and Clapboards.
- B. ASTM E228, Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
- C. ASTM G23, Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials, Replaced by G152 and G153.
- D. ASTM330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- E. ASTM331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- F. ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
- G. ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- H. UL-723 Standard Underwriters Laboratories Inc. for Test for Surface Burning Characteristics of Building Materials.

1.4 COMPLIANCE

- A. Fiber cement panels shall meet or exceed requirement of the following:
 - 1. ICC Evaluation Service, Inc. (ICC-ES) Evaluation Report No. ESR-1694.
 - 2. ICC-ES Legacy Report No. 5915.
 - 3. Canadian Construction Materials Centre (CCMC) Evaluation Report No. CCMC 13083-R.
 - 4. Refer to applicable building code compliance reports for the uniform wind load.

1.5 SUBMITTALS

- A. Drawings: Submit detailed drawings showing installation details.
- B. Product Data: Submit manufacturer's product description, indicating material types and thicknesses, and installation details.
- C. Samples: Submit samples of each product type proposed for use.
- D. Certificates: Submit documents certifying that products meet or exceed requirements herein.

1.6 QUALITY ASSURANCE

- A. Performance requirements: Fiber cement panel products with the following typical properties:
 - 1. Linear Variation with Change in Moisture Content: M.D.: -0.006 in./ft., C.D.: 0.003 in./ft.
 - 2. Wet Flexural Strength: Avg. 1155.51 psi.
 - 3. Water Tightness: No water droplets were observed on any specimen.
 - 4. Freeze-thaw: No damage or defects were observed.
 - 5. Warm Water: No evidence of cracking, delamination, swelling, or other defects were observed.

6. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes were observed in any specimen.
7. Mean Coefficient of Linear Thermal Expansion: Avg. 3.18×10^{-6} in./in. F.
8. Surface Burning: Flame Spread: 0, Smoke Developed: 5.
9. Wind Load: Refer to ESR 1694 for specific design pressures.
10. Water Penetration: No water leakage was observed into wall cavity.
11. Weather Resistant: No cracking, checking, crazing, erosion, or other detrimental effects were observed.
12. Steady-State heat flux and thermal Transmission Properties Test: R Value of 1.23 F or better.
13. Fire Resistant: Walls should successfully endure a 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

1.7 WARRANTY

- A. Provide manufacturer's 50-year warranty against manufactured defects in fiber cement panels
- B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish
- C. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: Nichiha Corporation, 18-19 Nishiki 2-chome Naka-ku, Nagoya, Aichi 460-8610, Japan.
- B. US Sales Office: Nichiha USA, Inc., 6659 Peachtree Industrial Blvd., Suite AA, Norcross, GA 30092, Toll free: 1.866.424.4421, Office: 770.805.9466, Fax: 770.805.9467, www.NICHIHA.com.

2.2 MATERIALS

- A. Autoclaved, wood fiber reinforced cement panels bundled in accordance with manufacturers specifications and mixed with Portland cement and silica, etc.
 1. Basis of Design: Illumination Series panels as manufactured by Nichiha Corporation

2.3 PRODUCT DESCRIPTION

- A. Profile colors: Refer to finish legend on drawings.
- B. Panel Surface: Pre-primed ready to paint.
- C. Panel Dimensions: Nominal - 18" (h) x 6' (l) x 5/8" (t); Actual - 455mm (h) x 1,818mm (l) x 16mm(t).
- D. Panel Profile: Profiled along all four edges, such that both horizontal and vertical joints between the installed panels are shipped lapped.
- E. Panel Finish: Factory-applied sealant to panel edges, such that all joints will contain a factory sealant.
- F. Panel Weight: 37.9 lbs. per panel.
- G. Accessories: Pre-manufactured corners, pre-primed ready to paint.

2.4 ACCESSORIES AND INSTALLATION COMPONENTS

- A. Single Source Responsibility:
 1. Provide products for entire system from one acceptable manufacturer, unless otherwise acceptable to Construction Manager.
 2. Provide products from a single manufacturer to ensure material compatibility where different materials come in direct contact with each other.

PART 3 EXECUTION

3.1 HANDLING

- A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation.
- B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in shrinkage at ship lap joints, and such action may void warranty.
- C. Nichiha panels **MUST** be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage. Nichiha is not responsible for damage caused by improper handling.
- D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

3.2 JOB CONDITIONS

- A. Fiber cement panels can be installed over braced wood, steel studs and sheathing including; Plywood, OSB, plastic foam or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's), and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction.
- B. Allowable stud spacing: See manufacturer's installation instructions for details.
- C. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier [WRB] as defined by the 2012 IRC. Refer to local building codes Nichiha is not responsible for water infiltration
- D. Appropriate metal flashing should be used to prevent moisture penetration around all doors windows, wall bottoms, material transitions and penetrations. Please refer to local building codes for best practices.

3.3 SURFACE CONDITIONS

- A. Examine site to ensure substrate conditions are within specification for proper installation.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.4 CUTTING

- A. Always cut Nichiha Illumination Series panels outside or in a well-ventilated area. Do not cut the products in an enclosed area.
- B. Always wear safety glasses and NIOSH/OSHA approved respirator, whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer MSDS for more information.
- C. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade, for general cuttings. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB). Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505). Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.
- D. Silica Dust Warning: NICHHA products may contain some amounts of crystalline silica [a.k.a. sand, silicon dioxide], which is a naturally occurring mineral. The amount will vary from product to product. Inhalation of crystalline silica into the lungs and repeated exposure to silica can cause health disorders, such as silicosis, lung cancer, or death depending upon various factors. To be conservative, Nichiha recommends that whenever cutting, sawing, sanding, sniping or abrading the product, users observe the Safety Instructions above. For further information or questions, please consult the MSDS, your employer, or visit www.osha.gov/SLTC/silicacrystalline/index.html and www.cdc.gov/niosh/topics/silica. The MSDS for Nichiha products are available at www.nichiha.com, at your local Nichiha dealer or through Nichiha directly at 1.866.424.4421. **FAILURE TO ADHERE TO OUR WARNINGS,**

MSDS, AND OTHER INSTRUCTION MAY LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

3.5 FASTENING

- A. Corrosion resistant fasteners, such as hot-dipped galvanized nails and screws that are appropriate to local building codes and practices must be used. Stainless Steel fasteners are highly recommended in high humidity and high-moisture regions. Nichiha is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples, clipped head nails or fasteners that are not rated or designed for intended use. See manufacturer's detailed instructions for appropriate fasteners for construction method used.

3.6 INSTALLATION

- A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions and other applicable documents before installation.
1. Nichiha panels can be installed on many types of construction methods, review individual installation details for specifics for each type of construction method. Nichiha fiber cement panels can be installed over Wood and Metal Stud Construction, Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's), Concrete Block Structures (CBS's), and Pre-Engineered Metal Construction. Install Nichiha panels in accordance with the manufacturer's detailed installation instruction for the construction method used.
 2. Please consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building 45 feet or higher or three [3] stories or higher. Special installation conditions may be required.

3.7 FINISHING AND MAINTENANCE

- A. Review brick, stone and block Maintenance, Repair and Cleaning Guidelines for detailed care instructions.

END OF SECTION

SECTION 07540

THERMOPLASTIC MEMBRANE ROOFING

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. Mechanically fastened membrane roofing system.
 - 2. Roof insulation.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail Resistance: SH.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Base flashings and membrane terminations.
 - 2. Insulation fastening patterns.
- C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of meeting performance requirements.
- D. Maintenance Data: For roofing system to include in maintenance manuals.
- E. Warranties: Special warranties specified in this Section.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.
- C. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.

- D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
 - 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
 - E. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
 - D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- 1.8 PROJECT CONDITIONS
- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- 1.9 WARRANTY
- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards, walkway products, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 ROOFING MEMBRANE (No substitution allowed)

- A. Single Ply Roofing System as manufactured by Duro-Last Roofing Inc., 525 Morley Drive, Saginaw, MI., 48601, (800) 348-0280.
 1. 40 Mil Duro-Last Membrane
 2. Polyisocyanurate and 1/2 inch fiberboard insulation (min. R-21).
 3. Crickets and saddles.
 4. FM approved fasteners and 2 inch plates.
 5. Flashing and counterflashing.
 6. Color: White
- B. EverGuard Single Ply Roofing System as manufactured by GAF Materials Corporation; 1361 Alps Road, Wayne, NJ 07470; 800-766-3411.
 1. TPO-45, 45 mil Single Ply Membrane
 2. Polyisocyanurate and 1/2 inch fiberboard insulation (min. R-21).
 3. Crickets and saddles.
 4. FM approved fasteners and 2 inch plates.
 5. Flashing and counterflashing.
 6. Color: White

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- C. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- D. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
 - 1. Manufacturers:
 - a. Celotex Corporation.
 - b. Firestone Building Products Company.
 - c. GAF Materials Corporation.
 - d. Johns Manville International, Inc.
 - e. Koppers Industries.
 - f. RMAX.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.
- D. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch(13 mm) thick.

2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch(5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Deck."
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches(50 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches(150 mm) in each direction.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch(6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch(6 mm) of nailers, projections, and penetrations.
- F. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 - 2. Install subsequent layers of insulation in a cold fluid-applied adhesive.
- G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches(150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.

3.4 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- H. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.

3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
 - C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
 - D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
 - E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- 3.6 WALKWAY INSTALLATION
- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- 3.7 FIELD QUALITY CONTROL
- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
 - B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect and Construction Manager.
 - 1. Notify Architect and Construction Manager 48 hours in advance of date and time of inspection.
 - C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
 - D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 3.8 PROTECTING AND CLEANING
- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect, Construction Manager, and Owner.
 - B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 07540

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Coping and cap flashing.
 - 2. Fasciae.
 - 3. Roof flashings.
 - 4. Counterflashings over base flashings.
 - 5. Counterflashings at roof mounted mechanical equipment and vent stacks.
 - 6. Reglet devices.
 - 7. [Counterflashings for roof hatches.]

1.2 SUBMITTALS

- A. General: Submit following items under provisions of Section 01330.
- B. Product Data: Indicating performance and physical characteristics of rolled products and accessories proposed for use.
- C. Shop Drawings: Indicate each type and configuration of flashing and trim work in profile including jointing pattern and details, fastening methods and frequency, locations of expansion and control joints, thickness of materials and finishes.
- D. Color Charts: Manufacturer's standard pre-finished product charts showing actual physical coating.
- E. Manufacturer's Instructions: Printed manufacturer's installation instructions.
- F. Warranty: Two copies of watertightness warranty, and finish coating warranty on pre-finished products.
- G. Submit samples under provisions of Section 01330.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in sheet metal flashing work with 3 years minimum experience in similar sized installations.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect products under provisions of Section 01600.
- B. Stack pre-formed material to prevent twisting, bending, and abrasions, and to provide ventilation.
- C. Prevent contact with materials that may cause discoloration or staining.
- D. Ship pre-coated products with strippable covering.

1.5 WARRANTY

- A. Provide warranties under provisions of Section 01780.
- B. Provide 2 year watertightness guarantee beginning at substantial completion including repair or replacement of defective materials and workmanship.
- C. Provide 20-year material finish guarantee against cracks, blistering, crazing, chalking, and color fading on pre-finished materials, commencing at substantial completion.

PART 2 PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS - SHEET MATERIALS

- A. Galvanized Steel: ASTM A 525, G90 coating, hot dipped galvanized both sides, flattened sheets, chemically treated, gage as recommended in Architectural Sheet Metal Manual for intended purposes except minimum 24 gage.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
 - 1. Mechanically brushed.
 - 2. Anodized Finish: Apply the following coil-anodized finish:
 - a. Class I, Electrolytically deposited color Anodic Finish: AA-M32 C22 A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 3. One coat clear fluoropolymer.
 - 4. Color: As noted in drawings.
 - 5. Supply material from one lot of metal.
- C. Sheet Metal Thickness/Mass:
 - 1. Flashing: .040".
 - 2. Coping, Fascia/Gravel Stop, Scupper: .040".
- D. Substitutions: Submit under provisions of Section 01600.

2.2 FABRICATION

- A. Form sections true to shape, accurate in size, square, free from distortion and defects, to profiles indicated in accordance with SMACNA Architectural Sheet Metal Manual.
- B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.
- C. Form pieces in longest practical lengths.
- D. Hem exposed flashings on underside 1/2 inch; miter and seam corners.
- E. Form materials that are typically concealed from view by the public with lap seams. On exposed seams, use butt-seam/back-up plate type unless noted or detailed otherwise.
- F. Solder and seal metal joints except those indicated or required to be expansive type joints. After soldering, remove flux. Wipe and wash solder joints clean.
- G. Fabricate corners from one place with minimum 18 inch long legs; solder for rigidity; seal with sealant.
- H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- I. Fabricate flashings to allow toe to extend minimum 2 inches over wall surfaces.
- J. Fabricate as much as possible in shop with machinery to eliminate as much hand tooling on the job as possible. Shop fabricate to allow for adjustments in the field for proper anchoring and joining.

2.3 ACCESSORIES

- A. Fasteners
 - 1. Nails: AISI Series 300 for galvanized steel. Use annular ring shank type, No. 12 gage or larger to suit application, of sufficient length to penetrate backing material at least 7/8 inch.
 - 2. Screws and Bolts: AISI Series 300 for galvanized steel; of sufficient size and length to sustain imposed stresses.
- B. Solder Materials
 - 1. Flux: Type as recommended by sheet material manufacturer; not detrimental to base material. Use resin type flux for terne metal.
 - 2. Solder: ASTM B 32 type, 50 percent tin/50 percent lead for galvanized steel.
- C. Underlayment: ASTM D 4869, Type I, No. 30 non-perforated asphalt-saturated organic felts.
- D. Protective Back Paint: Bituminous.
- E. Sealants: Two component polyurethane, non-sagging, sealant as specified in Section 07920.

- F. Reglets:
 - 1. Acceptable Product: Type SM Springlok flashing reglet by Fry Reglet, Norcross, GA.
- G. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FINISHES

- A. Galvanized Steel: Paint in accordance with Section 09910.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to receive work of this section. Notify Construction Manager of any existing conditions that will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- C. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Field measure site conditions prior to fabricating work.
- B. Install starter and edge strips, and cleats before starting installation.
- C. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- D. Install one layer of underlayment prior to installing copings and parapet caps.

3.3 INSTALLATION

- A. Install using skilled workmen in accordance with manufacturer's printed instruction and recommendations.
- B. Conform to drawing details included in manuals published by SMACNA.
- C. Insert flashings into reglets to form tight fit. Secure in place with wedges at maximum 12 inches on center. Seal flashings into reglets with sealant.
- D. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Construction Manager.
- E. Lap seam flashings and work not normally exposed to view. Use butt joint with back-up plate joint method exposed flashings, coping caps, and guards. Seal joints.
- F. Apply plastic cement compound between metal flashings and felt flashings.
- G. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- H. Seal metal joints watertight.
- I. Provide electrolytic separation between dissimilar metals with protective back paint.
- J. On soldered metal joints, make watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- K. Install expansion joints at frequency as recommended in SMACNA Architectural Sheet Metal Manual. Do not fasten seams such that movement is restricted. Coordinate expansion joint locations with joints in adjacent materials.

3.4 QUALITY CONTROL

- A. Install surfaces flat such that from normal viewing distances, no waviness or oil canning is visible.

3.5 CLEANING

- A. Perform final cleaning under provisions of Section 01740.

3.6 PROTECTION

- A. Protect finished installation under provisions of Section 01500.

3.7 SCHEDULE OF PRODUCTS USED

- A. Flashing and Counter Flashing: Fabricate as indicated on Drawings and in accordance with SMACNA Architectural Sheet Metal Manual, Chapter 4.
- B. Coping: As indicated on Drawings and in accordance with SMACNA Figure 3-4A.
- C. Fascia: As indicated on Drawings and in accordance with SMACNA Figure 2-1B.
 - 1. Joint System: In accordance with SMACNA Figure 2-5A.
- D. Splash Pan: SMACNA Figure 1-36 with corrugations to break water flow.

END OF SECTION

SECTION 07700

ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Curbs, equipment supports, pipe roller supports, and pipe portals.
 - 2. Integral support curbs, operable hardware, and counterflashings.
 - 3. Roof screen.

1.2 SYSTEM DESCRIPTION

- A. Curbs, Equipment Supports, Pipe Roller Supports, and Pipe Portals:
 - 1. Design Requirements: Manufacturer is responsible for designing units, including anchorage to structural system and necessary modifications to meet specified requirements.
 - 2. Structural Requirements: Design to support load of curb-mounted equipment.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01330.
- B. Include general construction, configurations, jointing methods and locations when applicable, and fastening methods.
- C. Submit manufacturer's installation instructions under provisions of Section 01330.
- D. Manufacturer's Product Data
 - 1. Submit manufacturer's descriptive literature and product specifications for each product.
 - 2. Indicate profiles, anchorages, jointing details, flashings, and accessories.
 - 3. Include color charts for finish indicating manufacturer's standard colors available for selection.
- E. Shop Drawings:
 - 1. Indicate typical layout including dimensions, configuration, locations, interface with adjacent systems, clearances, tolerances, frequency of attachment, and fabrication details.
 - 2. Submit detail drawings of transitions, intersections, and connections.
 - 3. Submit detail drawings of accessory components not included in manufacturer's product data.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Furnish each product from one manufacturer, unless otherwise acceptable to Construction Manager.
- B. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 5 years experience.
- C. Roof Curb Installer Qualifications: Acceptable to manufacturer with documented experience on at least 5 projects of similar nature in past 5 years.
- D. Certifications:
 - 1. Submit manufacturer's certification that products furnished for Project meet or exceed specified requirements.
 - 2. Submit Contractor's and installer's certification that products are installed in accordance with Contract Documents.

1.5 COORDINATION

- A. Coordinate installation of hatches with roof framing, adjacent sheet metal flashing work, and curb installation.
- B. Verify sizes of roof openings and curb dimensions.

1.6 WARRANTY

- A. Provide warranty under provisions of Section 01780.
- B. Warranty proper operation, and against defects in material and workmanship for a period of 5 years.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Quality Galvanized Steel: ASTM A 446 with galvanized coating complying with ASTM A 525, Z275 coating.
- B. Commercial Quality Galvanized Steel: ASTM A 526 with galvanized coating complying with ASTM A 525, Z275 coating.
- C. Aluminum Extrusions: ASTM B 221, alloy and tempered as required by manufacturer for intended use but not less than strength and durability qualities of alloy 5005-H15.
- D. Aluminum Sheet: ASTM B 209, alloy and tempered as required by manufacturer for intended use but not less than strength and durability qualities of alloy 6063-T5.
- E. Preservative Pressure Treated Wood: Softwood lumber treated in accordance with AWWA C2 for above grade use.
- F. Bituminous Paint: SSPC Paint 12.
- G. Roofing Cement: ASTM D 4586, Type I.

2.2 PIPE PORTALS

- A. Acceptable Products and Manufacturers:
 - 1. N-Series Pipe Portal, Custom Curb, Inc., Chattanooga, TN.
 - 2. PCC Cap, The Pate Company, Broadview, IL.
 - 3. Pipe Portal Systems, Portals Plus, Inc., Bensenville, IL.
 - 4. Pipe Portal System, Roof Products Systems Corporation, Bensenville, IL.
 - 5. TP-1 Piping Cover, ThyCurb Division of Thybar Corporation., Addison, IL.
- B. Description:
 - 1. Manufacturer's standard ABS and EPDM rubber boots to accommodate 3/8 through 6 inch diameter pipe.
 - 2. Furnish complete with stainless steel hose clamps.
 - 3. Accommodate quantity and size of piping to pass through portal caps.
 - 4. Fabricate for mounting atop manufacturer's curb.

2.3 ROOF SCREEN

- A. Screen: Metal decking panels on metal channel frames.
 - 1. Sheet Steel: ASTM A 611, Grade C, prime painted.
 - 2. Welding Materials: AWS D1.1 and D1.3.
 - 3. Primer: Grey oxide type.
- B. Supports: 0.064 spun aluminum vent with Santoprene boot, primed and pre-flashed with Modified bitumen membrane.
 - 1. Acceptable Product: Adjustable M-Vent by MWeld, Inc. with Brai Supreme APP Granule.]

2.4 VENT PIPES

- A. 0.064 spun aluminum vent in standard 5-inch and 9-inch sizes, primed and pre-flashed with modified bitumen membrane.
 - 1. Acceptable Product: Standard M-Vent by MWeld, Inc. with Brai Supreme APP Granule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with work in accordance with Section 01450.
- B. Verify that deck, curbs, blocking, cants, roof membrane, and base flashing are in place and positioned correctly.
- C. Facia and Coping:
 - 1. Verify that coverage onto vertical finish materials is sufficient to result in watertight installation.
 - 2. Verify membrane terminations and base flashings are in place, sealed, and secure.
- D. Verify opening, curb, opening size, etc. for use at specified hatch prior to submitting shop drawings for approval. Modify and patch roof curb, flashing, etc., for a complete weathertight assembly.

3.2 INSTALLATION

- A. General:
 - 1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.
 - 2. Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals.
 - 3. Securely anchor roof accessories to supporting substrates with appropriate type fasteners.
 - 4. Coordinate with installation of roofing system and related flashings.
- B. Curbs: Integrate curbs with adjacent roofing systems, base flashings, and counter flashings to create watertight conditions.
- C. Install in accordance with manufacturer's instructions.
- D. Coordinate with installation of roofing system and related flashings for weathertight installation.
- E. Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals.

3.3 CLEANING

- A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.
- B. Clean primer, adhesive, flashing cements, and other products from surfaces, exposed sheet metal and bellows.

3.4 PROTECTION

- A. Protect finished work in accordance with Section 01500.

END OF SECTION

SECTION 07721

GREASE CONTAINMENT ASSEMBLIES

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. Grease containment assembly.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Minimum 5 years experience manufacturing grease containment assemblies.
- B. Installer Qualifications: Trained and authorized by manufacturer of assembly.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials from physical damage and from deterioration by moisture, soiling, and other sources. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.6 SEQUENCING AND SCHEDULING

- A. Install assembly after roof is complete and curb has been installed.
- B. Install prior to electrical connections of exhaust fans.

1.7 MAINTENANCE DATA

- A. Submit manufacturer's printed maintenance recommendations.
- B. Continuing Maintenance: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting at time of Substantial Completion, stating services, obligations, conditions and terms for agreement period, and for renewal options.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Contractor provided and installed.
 - 1. Facilitec Corporation, 180 Corporate Drive, Elgin, IL 60123. 800-284-8273 or facsimile 847-931-9629.

- B. Acceptable Product:

- 1. G2[®] Grease Guard[®] Model #G2XD90 by Facilitec Corporation or equal.

2.2 MATERIALS

- A. Frame Materials:
 - 1. Anodized Aluminum Extrusions: 6063-T5 complying with ASTM B 221
 - 2. Hardware:
 - a. Molded Corners.

- B. Grease Containment Materials:
 - 1. Top Pre-Filter: Pass-through, noncombustible, self-extinguishing filter constructed from an open cross section polymer.
 - 2. Middle Filter: An advanced filter composite consisting of the following components:
 - a. Transfer Layer: Constructed from polyolefin fiber. Designed for quick transfer of oil based fluids to the absorption layers, while repelling rainwater. UV stability protects the absorption layers from damaging sunrays.
 - b. Absorption Layer: Constructed from an engineered open cell polyolefin fabric. Over 50 layers of absorbent microfibers wick and contain oil based fluids, while repelling rainwater. Absorption capacity is up to 39 fluid ounces per square foot.
 - c. Barrier Layer: Constructed from a closed cell polymeric blend providing a leak proof barrier.
 - 3. Bottom Filter: Airflow layer constructed from an open cross section polymer supporting the middle filter while allowing air to circulate throughout the entire filter system.
 - 4. Fire Shield: Fireproof barrier that protects the roof and building from any potential exhaust system fire hazards.
- C. Fiberglass Hold Down Poles and Connectors.
- D. Grease Deflecting Flashing: ASTM B 209 formed 24 gauge galvanized steel. UV stable copolymer flashing corners.

2.3 EQUIPMENT

- A. Fabrication: Consisting of an extruded aluminum frame with molded corners and a 50 to 100 layer grease containment system, with accessory hold down poles and grease deflecting flashings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Assemble and install in compliance with manufacturer's printed instructions.
- B. Clean roof surface of grease and foreign objects, adjacent to the exhaust fan curb.
- C. Install framing extrusions around fan curb with manufacturer's molded corners.
- D. Cut fire shield to exact curb dimensions
- E. Cut bottom filter and top pre-filter to exact curb dimensions
- F. Cut middle filter to exact curb dimensions
- G. Use the curb cutouts to layer at the seams or at the spout side per manufacturer's printed instructions.
- H. Cut custom unit filters to exact dimension between frame and fan; also cut filters and lay strips of filters underneath fan and exposed ductwork to completely cover roofing area under and around fan between the assemblies extrusions.
- I. Install the filters starting with the fire shield first, then the bottom filter, then the middle filter, then the top pre-filter.
- J. Install hold down poles and connectors. Secure filter system within framework.
- K. Attach flashing kit to 4 sides of the roof curb by installing underneath the lip of the exhaust fan, and then screw the flashing to the curb.

END OF SECTION

SECTION 07840

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Firestop devices and systems tested in accordance with ASTM E 814 (ANSI/UL 1479) and listed in UL Fire Resistance Directory.
 - 2. Fire resistant construction joints.
 - 3. Duct and damper firestops.

1.2 SYSTEM DESCRIPTION

- A. General: Comply with UL Fire Resistance Directory, authority having jurisdiction, and applicable codes for:
 - 1. Materials, fabrication, and installation of firestops.
 - 2. Fire containment.
 - 3. Fire resistant construction joints.
- B. Firestop Voids and Openings in Following Locations:
 - 1. Duct, cable, cable tray, conduit, piping, and other penetrations through fire rated walls and partitions.
 - 2. Penetrations of vertical shafts, pipe chases, elevator shafts, and utility shafts.
 - 3. Openings, gaps, and cracks at abutting fire rated assemblies and components, such as wall-to-wall and wall-to-floor including overhead floor and roof decks.
 - 4. Blank openings into or through fire rated floors and walls.
 - 5. Other locations indicated.
- C. Design Requirements:
 - 1. Insulated Piping and Duct Penetrations: Install firestop systems intended for use with type of insulation on penetrating item.
 - a. If compatible firestop system is unavailable, remove insulation at contact area with firestop material.
 - b. Coordinate with trades who installed insulation to ensure proper re-sealing of cut edges of insulation.
 - 2. Provide Products that Do Not Deteriorate when Exposed to Following Conditions:
 - a. Plumbing and Wet-Pipe Sprinkler Systems: Moisture-resistant through-penetration firestop.
 - b. Exposed to View: Flame-spread value of less than 25 and smoke-developed value of less than 450, ASTM E 84.
 - 1) Compatible with applied finishes.
- D. F and T Rating Requirements: Conform to F and T ratings, ASTM E 814 (ANSI/UL 1479).
 - 1. Comply with applicable codes and authority having jurisdiction.
 - 2. F Ratings: Equal to fire resistance rating of assembly being penetrated but not less than one hour.
 - 3. T Ratings: Equal to F ratings or as required by authority having jurisdiction.
- E. Testing Requirements: Utilize systems and materials tested and approved by UL or other nationally recognized independent testing agency acceptable to authorities having jurisdiction.
 - 1. Determine fire ratings in accordance with ASTM E 814 (ANSI/UL 1479) for through penetration firestops, ASTM E 119 (UL263) for fire rated assemblies, and as required by applicable codes and authority having jurisdiction.

- F. Large openings may be closed with same type construction as adjacent floor, roof, and wall assembly.
- G. Sealing around penetrations fire rated assemblies without approved firestop system is not permitted. Methods and materials not permitted include but are not limited to:
 - 1. Joint compound at gypsum board assemblies.
 - 2. Mortar at masonry and concrete assemblies.
 - 3. Use of joint sealants.
- H. Whenever finished firestop materials are scheduled to receive finish paint or other coatings, test compatibility of firestop materials with coatings to be applied.

1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Products and Classifications Schedule:
 - 1. Provide tabular form schedule for firestops, fire containment, and fire resistant construction joints.
 - 2. Schedule to identify:
 - a. Construction penetrated including fire resistance rating.
 - b. Penetrating item.
 - c. Products and manufacturers included in each system.
 - d. Form material used.
 - e. Firestop classification and description from UL or other nationally recognized independent testing agency acceptable to authority having jurisdiction.
 - f. Fire containment and fire resistant construction joint description.
 - g. F and T ratings.
 - 3. Update schedule periodically to include addition and changes.
- C. Submit product data for each product indicating characteristics and performance criteria.
- D. Shop Drawings: Submit drawings showing each type of condition requiring firestops, fire containment, and fire resistant joints.
 - 1. Indicate UL or other nationally recognized independent testing agency test assembly number, materials utilized, anchorage, installation method, adjacent construction materials and thicknesses, and fire ratings.
- E. Informational Submittals: Submit following:
 - 1. Test Reports: Copy of UL or other acceptable testing agency report illustrating each system and device as tested and approved.
 - 2. Certifications specified in Quality Assurance article.
 - 3. Qualification Data: Manufacturer's and installer's qualification data.
 - 4. Manufacturer's instructions.
 - 5. Manufacturer's field reports.
- F. Closeout Submittals: Submit specified warranty in accordance with Section 01780.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 5 years documented experience.
- B. Installer Qualifications: Company specializing in installation of firestopping specified with documented experience on at least 5 projects of similar nature in past 3 years.
 - 1. Licensed, trained, and approved by manufacturer of firestop materials.
- C. Installer Responsibility: Select firestop, fire containment, and fire resistant construction joint products from those indicated for each penetration.
 - 1. Obtain approval of authorities having jurisdiction for selected methods.
 - 2. Submit proposed methods along with proof of acceptance by authority having jurisdiction.
- D. Regulatory Requirements: Ensure firestop, fire containment, and construction joint components comply with applicable portions of local, state, and federal codes, laws, and ordinances for flame spread and smoke developed indices.
- E. Certifications: Submit following

1. Manufacturer's certification that products furnished for Project meet or exceed specified requirements.
2. Contractor's and installer's certification that products are installed in accordance with Contract Documents, based on inspection and testing specified as part of Field Quality Control.
3. Certificates of compliance from authority having jurisdiction indicating approval of firestops, fire containments, and construction joints.
4. Certificate of inspection and acceptance by authority having jurisdiction of firestops, fire containments, and construction joints.

1.5 FIELD SAMPLES

- A. General: Comply with Section 01450.
 1. Sample Installation: Install one of each type of firestop, fire containment, and construction joint at location as indicated directed by Construction Manager.
 2. Accepted field samples should remain unconcealed during construction as standard for judging completed work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01600.
 1. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's unopened containers with manufacturers name, product identification, lot number, UL labels or labels of other nationally recognized independent testing agency, and mixing and installation instructions.
 2. Storage and Protection: Store materials to prevent deterioration and damage due to moisture, temperature change, and contamination.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Comply with manufacturer's temperature and humidity limitations before, during, and after installation.
 2. Comply with ventilation requirements specified in Section 01500.

1.8 SEQUENCING

- A. Sequence Work under provisions of Section 01100.
 1. Identify penetrations and openings requiring firestops, fire containments, and construction joints.
 2. Schedule installation of firestopping after completion of work involving penetrating items, but prior to covering, concealing, and eliminating access to penetrations.
 3. Coordinate with work of other trades
- B. Inspection: Request inspection of firestops by authority having jurisdiction before concealment.
 1. Sequence work to permit installation to be inspected and approved prior to being concealed.
 2. Ensure that subsequent openings and penetrations are reported, properly firestopped, and inspected.

PART 2 PRODUCTS

2.1 FIRESTOPPING DEVICE AND SYSTEM MANUFACTURERS

- A. Through Penetration Firestop Devices. Comply with UL classification XHCR.
 1. Acceptable Manufacturers:
 - a. The Rectorseal Corp., Houston, TX.
 - b. Hevi-Duty/Nelson, Unit of General Signal Corp., Tulsa, OK
 - c. 3M Fire Protection Products, St. Paul, MN.
 - d. Specified Technologies Inc., Sommerville, NJ.

- e. Accepted Substitute in accordance with Section 01600.
- B. Through Penetration Firestopping System. Comply with UL classification XHEZ.
 - 1. Acceptable Manufacturers:
 - a. FireMaster, Thermal Ceramics, Augusta, GA.
 - b. Hilti, Tulsa, OK.
 - c. The Rectorseal Corp., Houston, TX.
 - d. Hevi-Duty/Nelson, Unit of General Signal Corp., Tulsa, OK.
 - e. 3M Fire Protection Products, St. Paul, MN.
 - f. Tremco, Beachwood. OH.
 - g. United States Gypsum Company, Chicago, IL.
 - h. Accepted Substitute in accordance with Section 01600.

2.2 FIRE RETARDANT PRODUCTS AND MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. FireMaster, Thermal Ceramics, Augusta, GA.
 - 2. Fibrex Co., Aurora, IL.
 - 3. Hilti, Tulsa, OK.
 - 4. Manville Building Insulation, Schuller International, Inc., Denver, CO.
 - 5. National Gypsum Company, Charlotte, NC.
 - 6. Hevi-Duty/Nelson, Unit of General Signal Corp., Tulsa, OK.
 - 7. Partek Insulations, Inc., Phenix City, AL.
 - 8. Rectorseal Corporation, Houston, TX.
 - 9. 3M Fire Protection Products, St. Paul, MN.
 - 10. Tremco, Beachwood. OH.
 - 11. The Rectorseal Corp., Houston, TX.
 - 12. United States Gypsum Company, Chicago, IL.
 - 13. Accepted Substitute in accordance with Section 01600.
- B. Fire Retardant Sealants: Single component, asbestos free, neutral cure.
 - 1. Acceptable Manufacturers and Products:
 - a. Specified Technologies Inc: Pensil 100 Firestop Sealant.
 - b. Hilti: FS 605, FS 611A.
 - c. Hevi-Duty/Nelson: CLK Firestop Sealant.
 - d. Rectorseal:
 - 1) Biotherm 100 (non-sag); 200 (self-leveling).
 - 2) Metacaulk 835, 880, 910, 950.
 - e. 3M Products: Fire Barrier CP-25WB; CP-25N/S (no-sag); CP-25S/L (self-leveling), Fire Dam 150.
 - f. Tremco: Fyre-Shield.
 - g. United States Gypsum Company: Thermafiber Smoke Seal.
- C. Fire-Resistive Elastomeric Joint Sealants: Single component, asbestos free, neutral cure.
 - 1. Movement Capability: 40 percent, ASTM C 719.
 - 2. Acceptable Manufacturers and Products:
 - a. Specified Technologies Inc: Pensil 300 Firestop Joint Sealant.
 - b. Hilti: FS 601.
 - c. 3M Products: Fire Barrier 2000/2003 Silicone Sealant.
 - d. Tremco: Fyre-Sil, Fyre-Sil S/L.
 - e. Rectorseal: Metacalk 880.
- D. Fire Retardant Putty: Single component, asbestos free, dielectric, non-hardening, intumescent putty.
 - 1. Acceptable Manufacturers and Products:
 - a. Hevi-Duty/Nelson: FSP Firestop Putty.
 - b. Specified Technologies Inc: SpecSeal Firestop Putty.
 - c. Tremco: Tremstop FP.
 - d. 3M: Fire Barrier Moldable Putty.
- E. Fire Retardant Job-Mixed Vinyl Compound: Dry gypsum/vinyl compound, non-asbestos, site mixed with water.

1. Acceptable Manufacturers and Products:
 - a. United States Gypsum Company: Firecode Compound.
 - b. National Gypsum Company: Sta-smooth FS 90 Fire-Shield Compound.
- F. Fire Retardant Intumescent Wrap Strips: Foil backed, intumescent wrap strips.
 1. Acceptable Manufacturers and Products:
 - a. Specified Technologies Inc: SpecSeal WrapStrip.
 - b. 3M: FS 195 Fire Barrier Wrap Strip.
 - c. Tremco: Tremstop.
 - d. Rectorseal: Metawrap 60.
- G. Firestop Forming Materials: Comply with UL XHKU.
 1. Acceptable manufacturers:
 - a. Manville Building Insulation, Schuller International, Inc.
 - b. USG Interiors Inc.
 2. Temporary Forms: Type X gypsum board.
- H. Accessories: Provide accessories required by manufacturer, UL or other testing agency, and classification for specific application.
 1. Retaining Collars: Manufacturer's standard.
 2. Steel wire, wire mesh, clips, sleeves, anchoring devices, primers, and other materials.
 3. Metal Sheets and Shapes: Size and thickness as required by fire resistant system.

2.3 FIRE SAFING INSULATION PRODUCTS AND MANUFACTURERS

- A. Fire Safing Insulation, Unfaced: Mineral fiber composition, unfaced.
 1. Classification:
 - a. ASTM C 612; Class 1 or 2.
 - b. ASTM C 665; Type I.
 2. Density and Thickness: Manufacturer's recommended to achieve indicated fire rating.
 3. Combustion Characteristics: ASTM E 136, noncombustible.
 4. Fire Rating: ASTM E 84, flame spread 25 or less and smoke development 10 or less.
 5. Acceptable Products:
 - a. Fibrex: FBX Safing Insulation.
 - b. Manville: Pyro-Fiber Safing Insulation.
 - c. Partek: Paroc Safing Insulation.
 - d. Tremco: Cerablanket F.S.
 - e. United States Gypsum: Thermafiber Safing Insulation.
 - f. Accepted Substitute in accordance with Section 01600.
- B. Fire Safing Clips: Size and type recommended by safing insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with work in accordance with Section 01450.
 1. Verify that permanent penetration items have been installed and that temporary penetrating items have been removed.
 2. Verify that supports have been installed on both sides of penetrated construction as required by UL or other testing agency classifications.
 3. Inspect and verify that surfaces and condition of openings have no defects that could interfere with installation and performance of firestop materials.
 4. Verify sleeves installed under Divisions 15 and 16 are properly installed.

3.2 PREPARATION

- A. General: Clean surfaces of opening substrates free of dirt, oil, grease, loose and harmful materials which may adversely affect bond of materials to surfaces in accordance with manufacturers recommendations.

1. Test surfaces that have been previously painted, sealed, and treated with other coatings and compounds to ensure compatibility with materials and proper bond capability.
2. Remove incompatible coatings and materials that may affect firestop bond with surrounding surfaces.
3. Mask and protect adjacent surfaces from damage.
4. Prime surfaces as instructed by manufacturer.

3.3 FIRESTOPPING INSTALLATION

- A. General: Install in accordance with Section 01600, manufacturer's details, applicable codes, UL or other testing agency classification requirements, and approved schedule and shop drawings.
 1. Fire resistant systems without UL or other testing agency classification requirements: Approved by authorities having jurisdiction before installation.
 2. Install firestopping material in manner required to achieve F rating and T rating required by UL classification, applicable codes, and authorities having jurisdiction.
 3. Install firestopping material with sufficient pressure to ensure uniform density and texture, and to ensure proper filling and sealing of openings to create smoke seal.
 4. Install forms and supports to arrest liquid and flowable material leakage and retain materials in openings.
 5. Remove form materials after firestopping material has cured unless materials used are permitted or required to remain according to test classifications.
- B. Through Penetration Firestopping Systems: Comply with classification design requirements. Separate cables not in conduit and maintain required separation of penetrating items from edges of openings and from each other.
 1. Tool and trowel exposed surfaces to smooth finish, flush with surrounding surfaces unless otherwise required by test classification.
 2. Remove excess firestop material promptly as work progresses.
- C. Through Penetration Firestopping Securely attach device frames to supporting construction.
 1. Assembly component parts to ensure proper contact and sealing of gaps and openings around penetrating items.
- D. Fire Resistant Construction Joints: Provide fire resistant systems to match fire rating of adjacent construction.
 1. Provide fire resistant systems at following locations:
 - a. Voids and gaps in fire rated construction, including control joints and gap at top of fire-rated CMU walls.
 - b. Fire rated partition and metal deck flutes.
 - c. Changes in partition material.
 - d. Floor joints not requiring expansion joint.
 - e. Other locations indicated and required by applicable codes.

3.4 FIELD QUALITY CONTROL

- A. Site Inspections: Comply with Section 01450.
- B. Inspection: Owner will engage and pay for services of an independent testing consultant to perform quality control inspection.
 1. Field Inspections: Provide certification of firestopping, fire containments, and fire resistant construction joints.
 2. Do not conceal firestopping, fire containments, and fire resistant construction joints prior to required inspection.
 3. Notify authority having jurisdiction and designated inspectors of work released for inspection.
- C. Inspection Requirements:
 1. Inspection: Visually examine firestopping, fire containments, and fire resistant construction joints to verify compliance with Contract Documents.

- a. Examine firestopping, fire containments, and fire resistant construction joints for proper installation, adhesion, and curing appropriate for each material.
- 2. Submit written inspection report including following information:
 - a. Identify construction penetrated including fire resistance rating.
 - b. Identify penetrating item.
 - c. Identify products and manufacturers included in each system.
 - d. Identify form material used.
 - e. Firestop classification and description from UI, FM, Warnock Hersey or other independent testing agency.
 - f. Fire containment and fire resistant construction joint description.
 - g. F and T rating.
 - h. State whether firestop, fire containment, and fire resistant construction joint is or is not in full compliance with testing agency classification, description and manufacturer's requirements. If variations occur confirm acceptance of variation by manufacturer and authority having jurisdiction.
- D. Re-examine firestopping, fire containments, and fire resistant construction joints immediately prior to concealment by other construction to ensure no damage has occurred since initial inspection.
- E. Correct unacceptable firestopping, fire containments, and fire resistant construction joints, and provide additional inspection, to verify compliance with this Section, at no additional cost to Owner.

3.5 REPAIRS AND MODIFICATIONS

- A. Identify damaged and re-entered seals requiring repair and modification.
 - 1. Remove loose and damaged materials.
 - 2. If penetrating items are to be added, remove enough material to permit penetration by new elements, being careful not to damage balance of seal.
 - 3. Repair holes, cracks, and damage in accordance with manufacturer's instructions to ensure complete smoke seal.
 - 4. Use only materials approved by manufacturer of original seal as suitable for repair.

3.6 CLEANING

- A. Clean as instructed by manufacturer. Do not use materials or methods which may damage firestop or surrounding construction.
 - 1. Remove stains and correct damage to adjacent surfaces

3.7 PROTECTION

- A. Protect finished work in accordance with Section 01500.
 - 1. Protect material subject to traffic from damage.

END OF SECTION

SECTION 07920

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Preparing sealant substrate surfaces.
 - 2. Sealant and backing.

1.2 DEFINITIONS

- A. Use definitions in ASTM C 717.
- B. Non-Bleeding: Not capable of exuding liquid chemical components of sealant.
- C. Non-Staining: Not capable of discoloring joint substrate.
- D. Sealant System: Sealant, sealant backing, and primer intended for use in particular condition.

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 01330.
- B. Product Data:
 - 1. Submit product data for each product.
 - 2. Include data to indicate performance criteria, limitations, substrate preparation, installation requirements, and curing requirements.
 - 3. Include information for accessories and other required components.
 - 4. Include color charts indicating manufacturer's full color range available of each sealant type for Architect's initial selection.
- C. Samples: Submit four 1/4 inch diameter by 2 inch long samples illustrating sealant colors for each product exposed to view.
- D. Submit the following Informational Submittals:
 - 1. Test Reports: Submit written results of testing specified as part of Source and Field Quality Control articles.
 - 2. Certifications specified in Quality Assurance article.
 - 3. Qualification Data: Manufacturer's and installer's qualification data.
 - 4. Manufacturer's instructions. Include requirements for surface preparation, priming, joint size ratios, adhesion testing, and perimeter conditions requiring special attention.
- E. Closeout Submittals:
 - 1. Submit under provisions of Section 01780.
 - 2. Warranty: Submit specified warranty.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Provide products for each sealant system from one manufacturer for entire Project, unless otherwise acceptable to Construction Manager.
 - 2. Provide products from a single manufacturer to ensure material compatibility where different sealant materials come in direct contact with each other.
 - 3. Provide each sealant system as complete unit, including accessory items necessary for proper function.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum 10 years documented experience.
- C. Applicator Qualifications: Acceptable to manufacturer, specializing in applying sealants, with documented experience on at least 10 projects of similar nature in past 5 years.

- D. Certifications:
1. Manufacturer's certification that products:
 - a. Furnished for the specific project meet or exceed specified requirements.
 - b. Assembled for each joint are compatible with each other and with joint substrates under conditions of service and application.
 - c. Are suitable for the indicated use.
 2. Manufacturer's certification that sealants, primers, and cleaners, comply with local regulations controlling the use of volatile organic compounds.
 3. Contractor's and installer's certification that products are installed in accordance with Contract Documents, based on inspection and testing specified as part of Field Quality Control.

1.5 FIELD SAMPLES

- A. Provide samples under provisions of Section 01330 and Section 01450.
- B. Preconstruction Field Sample:
 1. Construct sealant joint mock-up 5 feet long for elastomeric joint sealants specified in this Section.
 2. Position at location directed by Construction Manager.
 3. Perform "field hand-pull adhesion test" described under Field Quality Control.

1.6 PRE-INSTALLATION CONFERENCE

- A. Conduct pre-installation conference in accordance with Section 01310.
- B. Convene pre-installation conference 2 weeks prior to commencing work of this Section.
- C. Conference Purpose and Agenda:
 1. Visit Project site to analyze site conditions, and inspect surfaces and joints to be sealed in order that recommendations may be made should adverse conditions exist.
 2. Discuss following items:
 - a. Substrate conditions.
 - b. Preparatory work.
 - c. Weather conditions under which work will be done.
 - d. Anticipated frequency and extent of joint movement.
 - e. Joint design.
 - f. Sealant installation procedures.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01600.
- B. Deliver materials to site in unopened containers and bundles with labels indicating:
 1. Manufacturer's name.
 2. Product name and designation.
 3. Color.
 4. Expiration period for use.
 5. Working life.
 6. Curing time.
 7. Mixing instructions for multi-component materials.
- C. Storage and Protection:
 1. Store products within manufacturer's required temperature and humidity ranges.
 2. Prior to use, condition products within manufacturer's required temperature range, humidity range, and time period.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Perform sealing when the following are within manufacturer's limits during and for 24 hours after sealant installation:
 - a. Ambient and surface temperatures.
 - b. Relative humidity.

2. Do not apply sealants to wet or frozen surfaces.
3. Comply with manufacturer's requirements regarding application of sealants in vicinity of curing sealants of a different material.

1.9 SEQUENCING

- A. Sequence work under provisions of Section 01100.
- B. Coordinate work with Sections referencing this Section.
- C. Coordinate installation of sealants with substrates to which they are applied.

1.10 WARRANTY

- A. Provide warranties under provisions of Section 01780.
- B. Warrant installed products to be free from defects in material, labor, or installation techniques for 2 years.
- C. Include coverage for installed sealants and accessories which:
 1. Fail to achieve air-tight seal.
 2. Fail to achieve watertight seal.
 3. Exhibit loss of adhesion.
 4. Exhibit loss of cohesion.
 5. Do not cure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from manufacturers listed herein.
- B. Acceptable Acrylic Sealant Manufacturers:
 1. Tremco Corporation, Cleveland, OH.
 2. Pecora Corporation, Harleysville, PA
 3. Sonneborn Building Products/ChemRex, Inc., Minneapolis, MN.
 - 4.
- C. Acceptable Silicone Sealant Manufacturers:
 1. Tremco Corporation, Cleveland, OH.
 2. Dow Corning Corporation, Midland, MI.
 3. General Electric Silicone Products Division, Waterford, NY.
 4. Pecora Corporation, Harleysville, PA.
 5. Rhone-Poulenc, Inc., Princeton, NJ.
- D. Acceptable Urethane Sealant Manufacturers:
 1. Tremco Corporation, Cleveland, OH.
 2. Mameco International, Inc., Cleveland, OH
 3. Pecora Corporation, Harleysville, PA.
 4. Sika Corporation, Lyndhurst, NJ.
 5. Sonneborn Building Products/ChemRex, Inc., Minneapolis, MN.

2.2 MATERIALS

- A. Acrylic Latex (Designation AL):
 1. Description:
 - a. ASTM C 834.
 - b. Non-sag; non-staining; non-bleeding.
 - c. Joint movement range without cohesive/adhesive failure: Plus 7.5 percent to minus 7.5 percent of joint width.
 - d. Color: As selected by Architect from manufacturer's full color range.
 2. Acceptable Products:
 - a. AC-20, Pecora.
 - b. Sonolac, Sonneborn.
 - c. Acrylic Latex 834, Tremco.

- B. Silicone - General Purpose (Designation S-GP):
 - 1. Description:
 - a. ASTM C 920:
 - 1) Type: S
 - 2) Grade: NS
 - 3) Class: 25
 - 4) Uses: NT, M, G, A, O
 - b. Low modulus, single component, neutral curing, non-staining, non-bleeding silicone sealant.
 - c. Joint movement range without cohesive/adhesive failure: Plus 50 percent to minus 50 percent of joint width.
 - d. Color: Selected by Architect from manufacturer's full color range.
 - 2. Acceptable Products:
 - a. 795, Dow Corning.
 - b. Silpruf, General Electric.
 - c. 864, Pecora.
 - d. Rhodorsil 5C, Rhone-Poulenc.
 - e. Spectrum 1, Tremco.
- C. Silicone - Sanitary (Designation S-S):
 - 1. Description:
 - a. ASTM C 920:
 - 1) Type: S
 - 2) Grade: NS
 - 3) Class: 25
 - 4) Uses: NT, M, G, A, O
 - b. Neutral or acid curing, non-staining, non-bleeding, fungicide-containing.
 - c. Color: **Transparent or clear.**
 - d. Complying with United States Food and Drug Administration Regulation 21CFR-177-6000.
 - 2. Acceptable products:
 - a. 786 Mildew-Resistant Silicone Sealant, Dow Corning.
 - b. Sanitary 1700, General Electric.
 - c. 863, Pecora.
 - d. Rhodorsil 3B, Rhone Poulenc.
 - e. Tremsil 600, Tremco.
- D. Urethane - Traffic-Bearing (Designation U-TB):
 - 1. Description:
 - a. ASTM C 920:
 - 1) Type: M
 - 2) Grade: P or NS
 - 3) Class: 25
 - 4) Uses: T, M, O
 - b. Chemical curing, non-staining, non-bleeding.
 - c. Joint movement range without cohesive/adhesive failure: Plus 25 percent to minus 25 percent of joint width.
 - d. Shore A hardness: 35 minimum, when tested in accordance with ASTM D 2240.
 - e. Color: Selected by Architect from manufacturer's full color range.
 - 2. Acceptable Products:
 - a. Vulkem 245, 202, Mameco.
 - b. Dynatred, Pecora.
 - c. Sikaflex 2c/SL, Sika.
 - d. THC 900/901, Tremco.

2.3 ACCESSORIES

- A. Joint Cleaner:

1. Chemical cleaners required by sealant manufacturer for substrates encountered, compatible with sealant backing bond breaker materials.
 2. Free of substances capable of staining, corroding, or harming:
 - a. Joint substrates.
 - b. Adjacent nonporous surfaces.
 - c. Sealant.
 - d. Sealant backing.
 3. Formulated to promote optimum adhesion of sealants to joint substrates.
- B. Primer:
1. Dyed coating material required by sealant manufacturer for enhancing sealant adhesion to joint substrates.
 2. Non-staining to joint substrate beyond the substrate surface.
 3. Required for use unless not required by results of:
 - a. "Manufacturer's sealant-substrate compatibility and adhesion test" described under Source Quality Control.
 - b. "Field hand-pull adhesion test" under Field Quality Control.
- C. Sealant Backing Bond Breaker Rod:
1. Non-staining material.
 2. Compatible and non-adhering to sealant when tested in accordance with ASTM C 1087.
 3. Compatible with sealant, joint substrates, primers, and other sealant backing bond breakers.
 4. Sealant manufacturer approved.
 5. Sized and shaped to provide optimum performance and backing to sealant.
 6. Preformed, compressible, resilient, non-staining, non-outgassing, non-waxing, non-extruding, cylinder-shaped plastic foam rods compliant with ASTM D 1056 and D 1565.
 7. Open cell polyurethane: Use not permitted unless required by sealant manufacturer.
 8. Closed cell polyethylene:
 - a. Non-absorbent to liquid water.
 - b. Use in wall and ceiling joints unless otherwise required by sealant manufacturer.
 9. Reticulated Polymeric: Soft-Rod, Nomaco Inc., Zebulon, NC.
 10. Unless otherwise required by sealant manufacturer, oversize rod to be larger than joint width by following minimum amounts:
 - a. Open cell polyethylene: 50 percent.
 - b. Closed cell polyethylene: 33 percent.
 - c. Reticulated polymeric: 25 percent.
- D. Elastomeric Tubing Joint Filler:
1. Butyl, EPDM, or silicone tubing compliant with ASTM D 1056.
 2. Shore A hardness of 70.
 3. Compatible with sealant, joint substrates, primers, and other sealant backing bond breakers.
 4. Use in pavement joints, unless otherwise required by sealant manufacturer.
 5. Use sealant backing bond breaker tape to separate sealant from rod.
 6. Unless otherwise required by sealant manufacturer, oversize rod to be larger than joint width by 25 percent the following minimum amounts:
- E. Sealant Backing Bond Breaker Tape:
1. Pressure sensitive polyethylene tape or tetrafluoroethylene self-adhesive tape required by sealant manufacturer to suit application.
 2. Minimum Thickness of 11 mils.
- F. Masking Tape: Non-staining, non-absorbent material compatible with sealants and surfaces adjacent to joints.
- G. Tooling Liquids: Non-staining material approved by manufacturer to reduce adhesion of sealant to joint finishing tools.

2.4 MIXES

- A. Comply with manufacturer's instructions.
- B. Mix thoroughly with mechanical mixer without mixing air into sealants.
- C. Continue mixing until sealant is uniform in color and free from streaks of unmixed materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with work in accordance with Section 01450.
- B. Ensure that concrete and masonry have cured minimum of 28 days.
- C. Verify that sealant backing is compatible with sealant.
- D. Verify that substrate surface:
 1. Is within manufacturer's moisture content range.
 2. Complies with manufacturer's cleanliness and surface preparation requirements.
- E. Joint Width:
 1. Verify joints are greater than minimum widths required by manufacturer.
 2. If joints are narrower than minimum required widths, widen narrow joints to indicated width.
 3. Do not place sealant in joints narrower than manufacturer's required minimum.

3.2 PREPARATION

- A. Prepare, clean, and prime joints in accordance with manufacturer's instructions.
- B. Remove loose materials and matter that might impair adhesion of primer and sealant to substrate.
- C. Remove form release agents, laitance, and chemical retarders, which might impair adhesion of primer and sealant to concrete and masonry surfaces.
- D. Comply with ASTM C 1193.
- E. Protect elements adjoining and surrounding work of this Section from damage and disfiguration.
- F. Priming:
 1. Prime joint substrates unless priming is not required by:
 - a. "Manufacturer's sealant-substrate compatibility and adhesion test" described in Source Quality Control article.
 - b. "Field hand-pull adhesion test" described in Field Quality Control article.
 2. Apply primer to substrate areas where joint sealant is to adhere.
 3. Comply with manufacturer's sequencing requirements for joint priming and sealant backing bond breaker rod installation to assure required primer application coverage and rate without placement of primer on backer rod surface to be in contact with sealant and avoid three-sided sealant adhesion.
 4. Do not allow spillage and migration of primer onto surfaces not to receive primer.
 5. Install sealant to primed substrates after primer has cured.
- G. Masking Tape:
 1. Use masking tape to prevent contact of primer and sealant with adjoining surfaces that would be permanently stained or damaged by:
 - a. Contact with primer and sealant.
 - b. Cleaning methods used to remove primer and sealant smears.
 2. Place continuously along joint edges.
 3. Apply masking tape so it does not shift in position after placement.

3.3 APPLICATION

- A. General:
 1. Comply with requirements of Section 01600.
 2. Comply with results and recommendations from:
 - a. "Manufacturer's compatibility and adhesion test" described in Source Quality Control Article.

- b. "Field hand-pull adhesion test" described in Field Quality Control article.
 - 3. Provide compatible sealant system between dissimilar assemblies and adjacent construction.
 - 4. Seal locations necessary to create and secure continuous enclosure even though Drawings may not indicate all locations; do not seal weep holes.
 - 5. Seal to prevent migration of water, vapor, and air through joints.
 - 6. Comply with manufacturer's required application temperature and relative humidity ranges. Consult manufacturer when sealant cannot be applied within these ranges.
- B. Sealant Backing Bond Breaker:
 - 1. Measure joint dimensions and size materials to achieve manufacturer-required width-to-depth ratios.
 - 2. Install to achieve sealant depth and sealant contact depth no greater than distance required by manufacturer for sealant material, joint width, and joint movement range.
 - 3. Install using blunt instrument to avoid puncturing.
 - 4. Do not:
 - a. Twist, puncture, and tear material.
 - b. Leave gaps between ends of material pieces.
 - c. Stretch or compress material along its length.
 - d. Stretch or compress tape material along its width.
 - 5. Install to provide optimum joint profile and in manner to provide not less than 6 mm (1/4 inch) sealant depth when tooled.
 - 6. Install tape where insufficient joint depth makes use of rod not possible. Match tape width to joint width to prevent three-side adhesion. Do not wrap tape onto sides of the joint.
 - 7. Replace backing bond breaker materials that have become wet with dry materials prior to sealant application.
- C. Sealant:
 - 1. Install sealants at same time as installation of backing bond breaker materials.
 - 2. Do not exceed manufacturer's required:
 - a. Material shelf life.
 - b. Material working life.
 - c. Installation time after mixing.
 - 3. Comply with manufacturer's requirements for applying different sealant materials in direct contact with each other.
 - 4. Use gun nozzle size to suit joint size and sealant material.
 - 5. Install sealant with pressure-operated devices to form uniform continuous bead.
 - 6. Use sufficient pressure to fill voids and joints full.
 - 7. Install to adhere to both sides of joint.
 - 8. Install to not adhere to back of joint; provide sealant backing.
 - 9. Install sealant free of air pockets and embedded matter.
 - 10. Recess sealant 3 mm (1/8 inch) from surface of pavements and horizontal surfaces.
- D. Sealant Tooling:
 - 1. Comply with manufacturer's tooling method requirements.
 - 2. Tool sealant within manufacturer's tooling time limits.
 - 3. Tooling liquids:
 - a. Comply with manufacturer's requirements regarding use.
 - b. Do not use when not permitted by manufacturer.
 - c. Do not allow tooling liquids to come in contact with surfaces receiving sealant.
 - 4. Produce smooth exposed surface.
 - 5. Tool sealant to be free of:
 - a. Air pockets and voids.
 - b. Embedded impurities.
 - c. Surface ridges, sags, and indentations.
 - 6. Achieve full sealant contact and adhesion with substrate.
 - 7. Form a concave tooled joint shape indicated in Section A of Figure 5 of ASTM C1193, unless otherwise indicated.

8. Remove excess sealant from surfaces adjacent to joint.
 9. Allow acrylic latex sealant to achieve firm skin before paint is applied.
- E. Masking Tape:
1. Remove immediately after tooling sealant and before sealant skin forms.
 2. Remove without disturbing sealant.

3.4 FIELD QUALITY CONTROL

- A. General: Comply with requirements of Section 01450.
- B. Field Hand-Pull Adhesion Test:
1. At field sample:
 - a. Before sealant installation is commenced, test materials for indications of staining and poor adhesion to substrate.
 - b. Perform after sealants have fully cured.
 - c. Perform under observation of Construction Manager and manufacturer's technical representative.
 2. Subsequent to commencement of sealant installation:
 - a. Perform under observation of manufacturer's technical representative.
 - b. Perform minimum of 4 times prior to completion of sealant installation.
 - c. Schedule tests at evenly-spaced intervals during sealant installation at discretion of sealant manufacturer.
 3. Procedure:
 - a. Make knife cut through sealant from side to side of joint.
 - b. At joint's sides, make two cuts approximately 2 inches long meeting cut made across joint width.
 - c. Place a mark on cut portion of sealant 1 inch from cut across joint width.
 - d. Use fingers to grasp 2 inch piece of sealant firmly between mark and cut across joint width.
 - e. Pull cut portion outward at an angle of 90 degrees from sealant face.
 - f. Use a ruler to measure distance that sealant is pulled.
 - g. Pull uncut sealant out of joint to distance recommended by manufacturer for testing adhesive capability, but not less than a distance equal to maximum movement capability in extension.
 - h. Hold extended sealant for a minimum of 10 seconds.
 - i. If adhesion is proper, sealant should tear cohesively in itself or be difficult to adhesively remove from joint substrate.
 4. Summarize test results in test report. Indicate:
 - a. Sealants tested.
 - b. Joint substrates.
 - c. Cohesive failures.
 - d. Adhesive failures.
 - e. Pull distance used.
 - f. Actions to correct failures and non-complying conditions.
 5. In absence of noncomplying conditions, sealants which do not indicate adhesive failure from testing will be considered satisfactory.
 6. Replace sealant removed from test locations by applying sealant in accordance with manufacturer's requirements for applying sealant to previously sealed joints.

3.5 CLEANING

- A. Clean excess sealants and sealant smears from adjacent surfaces as application progresses; comply with sealant manufacturer's requirements and manufacturer of surface in which joints occur.
- B. Repair or replace defaced or disfigured finishes caused by work of this Section and replace where installation techniques result in unsatisfactory joining of materials and unsightly conditions.

3.6 PROTECTION

- A. Protect in accordance with Section 01500.
- B. Protect sealants from contamination until cured.
- C. Protect sealant joints in horizontal surfaces from foot and vehicular traffic until cured.

3.7 SCHEDULE

- A. Items Not to be Sealed:
 - 1. Joints, perimeter, and penetrations in fire-rated assemblies. Use firestops specified in Section 07840.
 - 2. Joints, perimeter, and penetrations in sound-rated assemblies. Use acoustical sealant specified with sound-rated assembly in Section 09250.
 - 3. Weep holes in masonry, metal railings, windows, and doors.
- B. Sealant Schedule:
 - 1. Exterior locations:
 - a. Wall joints:
 - 1) Bordered on both sides by porous building material (concrete, stone, masonry, exterior insulation and finish systems): Designation S-GP.
 - 2) Bordered on both sides by non-porous building material (coated and uncoated metals, anodized aluminum, porcelain tile, and glass): Designation S-GP.
 - 3) Bordered on one side by porous building material (concrete, stone, masonry) and other side by non-porous building material (coated and uncoated metals, anodized aluminum, porcelain tile, and glass): Designation S-GP.
 - b. Perimeter of penetrations through walls: Designation S-GP.
 - c. Expansion joints in ceilings, soffits, and overhead surfaces: Designation U-MC.
 - d. Control joints and perimeter of penetrations in ceilings, soffits, and overhead surfaces: Designation S-GP.
 - e. Wall and ceiling joints between frames and their rough opening: Designation S-GP.
 - f. Wall and ceiling joints between frames and adjoining surfaces: Designation S-GP.
 - g. Joints and perimeter of penetrations in horizontal pedestrian and vehicle traffic surfaces: Designation U-TB.
 - h. Exterior wall and ceiling joints over 50 mm (2 inches) in width: Designation S-GP.
 - 2. Interior Joints, unless noted otherwise for Designation S-S:
 - a. Wall and ceiling joints subject to movement: Designation S-GP.
 - b. Wall and ceiling joints not subject to movement: Designation AL.
 - c. Interior side of exterior openings: S-GP.
 - d. Floor joints: Designation U-TB.
 - e. Wall and ceiling joints between frames and their rough opening: Designation AL.
 - f. Wall and ceiling joints between frames and adjoining surfaces: Designation AL.
- C. Silicone-Sanitary (S-S) Schedule: Use in food preparation areas and other areas including, but not limited to, the following:
 - 1. General Building:
 - a. Top of quarry tile or cove base to wall (if indicated).
 - b. Floor to wall junctions.
 - c. Stainless steel kitchen equipment permanently mounted.
 - d. Shelves to walls (wood, stainless steel, plastic laminate).
 - e. Counter tops and back splashes to walls.
 - f. Electrical and plumbing penetrations through finished walls and floors.
 - g. Stainless steel or aluminum angle closures and corner guards.
 - 2. Special Areas (Interior):
 - a. Bar:
 - 1) Joints and edges of non-removable plastic laminated back panel of Bar.

- 2) Non-removable FRP back panel of Bar to floor.
- 3) Stainless steel equipment to walls and all joints.
- 4) Plug mold to wall.
- b. Food Prep, Cooking and Dishwashing Areas (Kitchen):
 - 1) Edges of surface mounted electrical equipment and fixtures to surfaces.
 - 2) Stainless steel equipment, including jambs at openings, to walls and all joints.
 - 3) Joints in stainless steel exhaust hoods.
 - 4) Stainless steel equipment to walls and all joints.
 - 5) Electrical penetrations through ceilings at ice machines.
 - 6) Edges of surface mounted electrical equipment and fixtures to surfaces at ice machines.
 - 7) Threshold edges at rear service and outer office doors.
 - 8) Edges of display case, time clock, card racks and ash tray to surfaces.
 - 9) Non-removable F.R.P. back panel of wall to quarry tile base.
- c. Public Toilets:
 - 1) Toilet bowls to tile floor.
 - 2) Urinals to tile floors and walls.
 - 3) Plumbing penetrations through surfaces.
 - 4) Edges of toilet room accessories to surfaces.
 - 5) Edges of mirrors.
- d. Dining:
 - 1) Top and bottom of wood bases to walls and floor.
 - 2) Vertical wood trim to exterior columns.
 - 3) Aluminum window frames to all surfaces.
 - 4) All threshold edges to surfaces.
- e. Vestibule:
 - 1) Top and bottom of wood bases to walls and floor.
 - 2) Aluminum window frames to all surfaces.
 - 3) Threshold edges to surfaces.
- f. Exterior:
 - 1) Joints between building slab and exterior concrete.
 - 2) Reglet in walls.
 - 3) Aluminum window frames to all surfaces.
 - 4) Threshold edges to surfaces.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Non-rated rolled steel doors and frames.

1.2 QUALITY ASSURANCE

- A. Conform to requirements of SDI-100.
- B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years experience.

1.3 SUBMITTALS

- A. Submit shop drawings, and manufacturer's installation instructions, under provisions of Section 01330.
- B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
- C. Indicate door elevations, internal reinforcement, closure method, and cut outs for glazing.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE AND PROTECTION

- A. Protect products under provisions of Section 01600.
- B. Protect doors and frames with resilient packaging.
- C. Break seal on-site to permit ventilation.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.6 COORDINATION

- A. Coordinate work under provisions of Section 01310.
- B. Coordinate the work with door opening construction, door frame and door hardware installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS - DOORS AND WELDED UNIT FRAMES

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Republic Builders Products.
 - 2. Ceco Corporation
 - 3. Fenestra Technologies Corp.
- B. Substitutions: Under provisions of Section 01600.

2.2 HOLLOW METAL FRAMES

- A. Exterior Frames: 14 gage thick material.
- B. Interior Frames: 16 gage thick material.
- C. Construction: Welded required; knocked-down not allowed.
- D. Corners of mitered design; stops coped and butted, or mitered.

- E. Accurately cope joints of mullions, rails, and other similar tubular members; reinforce joints with concealed clips or sleeves.
- F. Closed or tubular members may be fabricated of two pieces if interlocked at base of stops; visible seams or joints are not acceptable.
- G. Guard Box: Closed box design, 26 gage minimum, welded to frame. Provide at:
 - 1. Mortise hardware cutouts for assemblies installed within masonry walls or where assemblies have frame grouted with mortar or similar material at time of installation.
- H. Spreader: Manufacturer's standard temporary channel or angles tack welded at bottom of jamb members.
- I. Floor Anchor Clips: Provide at each jamb and mullions that extend to floor.
 - 1. In areas where concrete topping or other similar construction occurs, provide adjustable design to permit securing to depressed subfloor construction. In lieu of adjustable design, frames may extend to subfloor.
- J. Jamb Anchors
 - 1. Masonry Walls: 3/16 inch diameter crimped galvanized wire or corrugated steel T-strap design. Locate near bottom of frame, near top of frame, and 32 inches on centers maximum intermittently, minimum 3 per jamb.
 - 2. Metal Stud Wall Systems: Steel clips welded to frame, type or design compatible with stud system. Locate at top of frame, 12 inches from top and, 24 inches on centers maximum intermittently, minimum 4 per jamb.
 - 3. Previously Placed Concrete, Masonry, or Structural Steel: Tension plate and spacer design, welded to frame at approximately 24 inch centers, minimum 3 per jamb. Frames drilled and countersunk for 1/4 inch flathead anchor bolts, set below frame surface.

2.3 DOORS

- A. Exterior Doors: ANSI A250.8, Level III, Model 2, insulated, 16-gage steel face sheets.
- B. Interior Doors: ANSI A250.8 Level II Model 1, 18-gage steel face sheets.
- C. Door Core
 - 1. Interior Doors: Impregnated cardboard honeycomb.
 - 2. Exterior Doors: Polyurethane [polysytrene] insulation.
 - a. Insulated door insulation value of R- 8.0 for polyurethane.
- D. Face Construction:
 - 1. Interior: Face sheets broken to form and meet in joint on stile edges
 - 2. Exterior: Same as Interior except weld and grind smooth joints on stile edges.
- E. Vertical edges continuously reinforced from top to bottom with steel channels or flat bars placed immediately inside of face sheets. Vertical edges continuously reinforced from top to bottom with steel channels or flat bars placed immediately inside of face sheets.
- F. Reinforce top and bottom edge full width of door with steel channel not less than 16 gage.
- G. Fabricate exterior doors with top edge closed flush and fabricate bottom edge with flush closure where required for attachment of weatherstripping. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
- H. Provide insulating material in void spaces for sound deadening in assemblies utilizing internal core of steel stiffeners.
- I. Fill face welds and surface depressions with metallic paste filler or body putty, grind smooth and flush to unblemished finish appearance.
- J. Bevel lock or latch edge 1/8 inch in 2 inches at single doors and at meeting stiles at pairs of doors.
- K. Glazing Beads: Minimum 18 gage steel, screw on type, corners mitered, welded to door assembly on security side, removable on opposite side.
 - 1. Factory install and secure loose bead with countersunk oval head screws spaced 8 inches on center maximum and within 2 inches of ends.
 - 2. Coordinate dimensions for glazing rabbets with requirements of Section 08800.
- L. Vision Openings: Frame openings for sizes indicated.
 - 1. Equip with glazing beads.

2.4 ACCESSORIES

- A. Silencers: Drill or punch frames for silencers. Coordinate hole size with silencers specified in Section 08710.
 - 1. Single Interior Doors: Three at strike jamb.
 - 2. Pair of Interior Doors: Two at header.
 - 3. Weather-stripped Doors: None required.
 - 4. Sound, Light, or Smoke Sealed Doors: None required.

2.5 FABRICATION

- A. Fabricate frames as welded unit.
- B. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- D. Service Entrance Door at Kitchen:
 - 1. Provide 22 gage steel stiffeners placed 6 inches apart and welded every 5 inches along their length. Provide fiberglass, sound deadening insulation between stiffeners.
- E. Prepare frame for silencers.
- F. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.
- G. Fabricate frames for masonry wall coursing with 4 inch head member.

2.6 FINISH

- A. Interior Units: Baked on primer.
- B. Exterior Units: Baked on primer [over 1.25 ounces per square foot galvanizing, in accordance with ASTM A 386.]

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate conditions under provisions of Section 01450.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify surfaces and conditions are ready to receive work of this section. Notify Construction Manager of any existing conditions that will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

3.2 INSTALLATION

- A. Install frames in accordance with SDI-105.
- B. Install doors in accordance with DHI.
- C. Coordinate with masonry and gypsum board construction for anchor placement.
- D. Coordinate installation of glass and glazing.
- E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
- F. Set frames plumb, level, and true alignment, securely fastened to the floor and adjoining walls.
- G. Install doors accurately in frames, maintaining specified clearances.

3.3 TOLERANCES

- A. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

3.4 ADJUSTING AND CLEANING

- A. Adjust hardware and door movement for smooth, quiet and balanced door movement.

END OF SECTION

SECTION 08210

WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Flush wood doors; non-rated.

1.2 RELATED SECTIONS

- A. Section 08800 Glass and Glazing

1.3 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Shop Drawings: Illustrate door opening criteria elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware.
- C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria, factory finishing criteria.
- D. Samples:
 - 1. Submit 2 samples of door construction, 12 by 12 inch in size cut from bottom corner of door.
 - 2. Submit 2 samples of door veneer 12 by 12 inch in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain doors from single manufacturer to ensure uniformity in quality, appearance and construction.
- B. Perform work in accordance with AWI Quality Standard Section 1300, Custom Grade.
- C. Finish doors in accordance with AWI Quality Standard Section 1500, grades identified in schedule.
- D. Provide only 5 ply Architectural doors.
- E. Qualifications
 - 1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Package, deliver, and store doors in accordance with AWI Section 1300. Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on-site to permit ventilation.
- C. Comply with manufacturer's instructions and with requirements of NWWDA pamphlets "Recommended Handling and Finishing Instructions for Wood Fire Doors" and "How to Store, Handle, Finish, Install and Maintain Wood Doors."
- D. Deliver to site after wet construction operations are completed and dry and building has reached average prevailing relative humidity.
- E. Deliver in manufacturer's original unopened protective covering or container, clearly marked with manufacturer's name, brand name and identifying door opening number on covering.
- F. Storage:
 - 1. Store in clean, dry, ventilated area protected from sunlight.
 - 2. Avoid extreme heat, cold, dryness or humidity.

- 3. Store flat over level surface above floor on wood blocking.
 - 4. Under bottom door and over top of stack, furnish plywood or corrugated cardboard for protection.
 - G. Handling: Do not drag packaged or unpackaged doors across one another or across other surfaces.
- 1.6 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings.
- 1.7 COORDINATION
- A. Coordinate work under provisions of Section 01310.
 - B. Coordinate work with door opening construction, door frame and door hardware installation.
- 1.8 WARRANTY
- A. Provide warranty under provisions of Section 01780 to the following terms:
 - B. Warranty Period: Two years.
 - C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction.
 - D. Include hanging, installation of hardware and refinishing which may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Weyerhaeuser Company.
 - 2. Eggers Industries.
 - 3. Algoma Hardwoods, Inc.
 - 4. Mohawk Flush Doors, Inc.
- B. Substitutions: Under provisions of Section 01600.

2.2 DOOR TYPES

- A. Interior Doors: 1-3/4 inches thick; solid core construction.

2.3 DOOR CONSTRUCTION

- A. Core (Solid, Non-Rated): AWI Section 1300, Type PC Particleboard, Premium grade AA.
- B. Stile and Rail Construction: Veneered, minimum 1/16" before sanding; structural engineered core; edgebands same species as face veneer.
- C. Raised-Panel Construction
 - 1. Veneered, shaped, wood-based panel product with veneer conforming to raised-panel shape (3-ply veneer).
 - 2. Veneered, wood-based panel product with mitered, raised rims made from matching clear lumber (rim-banded).
- D. Flat-Panel Construction: Veneered, wood-based panel product.
- E. Glazing: 1/2" tempered float glass where indicated on drawings.

2.4 DOOR FACING

- A. Style: As indicated on drawings.
- B. Wood Veneer Facing: AWI Custom quality; species wood, plain sliced, with book matched grain, for transparent finish.
 - 1. Species: Red Oak.
 - 2. Grade: Clear in accordance with AWI, Section 100, Grade I quality standards.

2.5 ADHESIVE

- A. Facing Adhesive: Type I - waterproof.

2.6 FABRICATION

- A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
- B. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
- C. Vertical Exposed Edge of Stiles:
 - 1. Transparent Finish: Of same species as veneer facing.
- D. Fit door edge trim to edge of stiles after applying veneer facing.
- E. Bond edge banding to cores.
- F. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
- G. Factory pre-fit doors for frame opening dimensions identified on shop drawings.
- H. Openings: Trim openings indicated for glazing with solid wood moldings, with one side removeable.
 - 1. Solid Wood Moldings: Trim openings with material and profile as indicated.
 - 2. Field Glazing: Comply with applicable requirements in section 08800.

2.7 FINISH

- A. Transparent Finish: Factory finished in accordance with AWI Section 1500.
 - 1. AWI System as follows. Materials in following Finish System are applications of one coat unless indicated otherwise. Products are those as manufactured by Sherwin Williams Co. as a standard.
 - a. AWI Finish System No. 2 - Catalyzed Lacquer, Premium grade.
 - 1) Stain – As scheduled.
 - 2) Vinyl Washcoat - T67F3 Vinyl Sealer 24% (Reduced 1:6).
 - 3) Filler - D70T1 Natural Filler.
 - 4) Vinyl Sealer - T67F3 Vinyl Sealer 24%.
 - 5) Topcoat - T77 Series Catalyzed Lacquer - low gloss.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify frame opening conditions under provisions of Section 01450.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install non-rated doors in accordance with AWI Quality Standard requirements.
- C. Trim non-rated door width by cutting equally on both jamb edges.
- D. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
- E. Pilot drill screw and bolt holes.
- F. Machine cut for hardware. Core for handsets and cylinders.
- G. Coordinate installation of doors with installation of frames specified in Section 08110 and hardware specified in Section 08710.

3.3 INSTALLATION TOLERANCE

- A. Conform to AWI requirements for fit and clearance tolerances.
- B. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taught string, corner to corner, over an imaginary 36 by 84 inch surface area.

- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 by 84 inch surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taught string, edge to edge, over an imaginary 36 by 84 inch surface area.

3.4 ADJUSTING

- A. Adjust work under provisions of Section 01770.
- B. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08360

OVERHEAD FOLDING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Motorized overhead folding doors.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.
- B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.
- C. Section 05500 - Metal Fabrications: Steel frame and supports.
- D. Section 06100 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.
- E. Section 07920 - Joint Sealers: Perimeter sealant and backup materials.
- F. Section 08710 - Door Hardware: Cylinder locks.

1.3 REFERENCES

- A. [AS1170.2:2002](#) - Structural Design Actions - General Principles.
- B. [AS4100-1990](#)- SAA Steel Structures Code.
- C. AS 1288 - Glass in Buildings - Selection and Installation.
- D. AA-6063-T6 - Standards for Aluminum Alloy and Temper.
- E. ASTM A513, Type 1 – Steel Tubes.
- F. ASTM A1008 – Sheet Steel for Covers.
- G. ASTM A36 – Steel Bars.
- H. ASTM A36 – Sheet Steel for Tracks/Channels.

1.4 PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
 - 1. Design pressure of 12.8 lb/sq ft.
 - 2. Maximum deflection of 1/300 of opening width.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, accessories and anchors, jamb details, connection details, anchorage spacing, hardware locations, and installation details.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Operation and Maintenance Data.

- H. Submit written agreement in manufacturer's standard form signed by manufacturer and installer agreeing to repair or replace defective doors that are warped, twisted, bowed or damaged as a result of defective product.
- 1.6 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
 - B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
 - C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
 - B. Store materials in a clean, dry, ventilated, weathertight, secure location.
 - C. Protect materials from soiling, abuse, loss and moisture damage.
- 1.8 PROJECT CONDITIONS
- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - B. Environmental Conditions: Prior to and during installation, environmental conditions shall be in accordance with door manufacturers latest published recommendations for temperature, rain, wind, humidity, ventilation, and illumination.
- 1.9 WARRANTY
- A. Manufacturer warrants to the original purchaser within one year from date of installation, if a product sold under this warranty proves to be defective in material or workmanship through normal use and service according to maintenance and operations instructions, as verified by inspection by persons authorized by Renlita Overhead Doors, Renlita Overhead Doors will replace or repair (at Renlita Overhead Doors option) the defective product.
 - B. Manufacturer warrants the steel frame against rust, in painted non-damaged condition for a period of two years from original purchase. This warranty does not apply to scratched, dented, damaged or corroded areas of the frame.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: This Section is based on the products of Renlita Doors North America, LLC, which is located at [220 E 1st St Bonham, TX 75418](http://220%20E%201st%20St%20Bonham,%20TX%2075418). ASD. Tel: [903-583-7500](tel:903-583-7500). Fax: [903-583-7544](tel:903-583-7544). Web: www.renlitadoors.com.
- B. Substitutions: Not permitted.

2.2 Folding Overhead Doors

- A. Bi-Fold Doors: Vertically gliding door with no floor tracks.
 - 1. Approved Product: Monarch Sovereign Bi-Fold Door.
- B. Curtain: Constructed from 2-1/2 inch by 1-1/2 inch (65 mm by 40 mm) top and side rails and 1-1/4 inch by 1-1/2 inch (32 mm by 40 mm) mid rails.
- C. Panels: Panels shall be secured by glazing bead, santoprene or PVC wedges.
 - 1. Panel Heights: As indicated on Drawings.
 - 2. Panel Heights: Even division of the open height equaling 6 rows, not to exceed 24 inches per panel height.
- D. Brackets and Tracks: Mono section configuration.
- E. Side Guides: 5-1/2 inch by 2-3/8 inch (140 mm by 60 mm) extruded aluminum

- sections with twin 1/8 inch (3 mm) tracks.
- F. Hardware/Hinges: Cast stainless steel constructed hinges with teflon inserts to ensure quiet and low friction operation.
 - G. Lift Motor: Liftmaster 3900 ceiling mounted to G.C. provided blocking. Power requirement – 110V., 1ph, 6 amp. Provide keyed wall control switch and safety sensors.
 - H. Operation: Door shall be balanced by the use of torsion springs connected to a rotating shaft. The shaft ends are attached to cable drums which lift/lower the curtain via a flexible cable.
 - I. Size:
 - 1. Refer to drawings.
 - J. Locking:
 - 1. Centrally mounted, two way mortise key lock.

2.3 FINISHES

- A. Finish, Ferrous Metals: All surfaces except working machine parts shall receive the following factory applied finish:
 - 1. Powder coating.
 - 2. Abrasive clean to SSP-SP6
- B. Finish, Aluminum: Provide the following factory applied finish:
 - 1. Powder coating..
 - 2. Abrasive clean to SSP-SP6
- C. Finish, Color:
 - 1. Manufacturer/Color: 38/60090 Anodized Bronze, Matte.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Inserts and Anchorages: Furnish inserts and anchoring devices suitable for the installation of the units and consistent with the manufacturer's installation requirements. Coordinate delivery with other work to avoid delay.
- B. Install overhead doors, operating equipment, hardware, seals, stops, anchors, inserts, supports and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- C. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- D. Anchor assembly to wall construction and building framing without distortion or stress.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- F. Fit and align door assembly including hardware.
- G. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

- A. Lubricate, test and adjust door assembly to smooth operation free from warp twist or distortion and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

3.5 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

3.6 MAINTENANCE

- A. Post Installation Maintenance:
 - 1. Contractor and installer shall provide Owner with complete company name, address phone number, fax number and assigned contact for emergency repairs and scheduled maintenance for the installed door(s).
- B. Training/Instruction for Owner for Operation and System Maintenance:
 - 1. Manufacturer shall instruct Owner's representative in regular tenant provided maintenance and operation of installed doors.

END OF SECTION

SECTION 08380

TRAFFIC DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. High impact, flexible traffic doors.

1.2 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Product Data: Submit for doors, frames, and accessories.
 - 1. Include sample of warranty customized for this Project.
- C. Shop Drawings: Indicate elevations, plans, construction details, metal gages, hardware provisions, method of glazing and installation details.
- D. Informational Submittals: Submit for following packaged separately from other submittals.
 - 1. Support Reactions Design Data: Submit in accordance with Section 01330. Include other structural performance and coordination requirements as required. Coordinate with Section 05500.
 - 2. Manufacturer's instructions.
- B. Closeout Submittals: Submit warranty in accordance with Section 01780.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01600.
 - 1. Deliver doors, frames and accessories undamaged and with protective wrappings or packaging.
 - 2. Store material on platforms under cover in clean, dry, ventilated, and accessible locations.
 - 3. Remove damp or wet packaging immediately and wipe surfaces dry. Replace damaged materials.

1.4 PROJECT CONDITIONS

- A. Field verify opening sizes prior to preparation of shop drawings.

1.5 WARRANTY

- A. Special Warranty: Prepare and submit in accordance with Section 01780.
 - 1. Warrant installed doors and frames to be free from defects in material and workmanship for period of five years.

PART 2 - PRODUCTS

2.1 TRAFFIC DOORS

- A. Acceptable Manufacturers:
 - 1. Chase Industries, Portland, OR.
 - 2. Eliason Door Company, Kalamazoo, MI; www.eliasoncorp.com.
 - 3. Accepted Substitute in accordance with Section 01600.
- B. Basis of Design: Eliason Model SCP-3.

2.2 MATERIALS

- A. Core: 3/4 inch thick exterior grade solid wood, 1 inch total thickness.
- B. Facing: 18 gage full length stainless steel panel (both sides).
- C. Edge Trim: 18 gage stainless steel.
- D. Back Channels: 18 gage stainless steel.
- E. Base Plates: 18 gage stainless steel, 18 inches high, on each side.

2.3 ACCESSORIES

- A. Hinging System: Double action Easy Swing proprietary hinges; zinc coated.
- B. Vision Panels: 9"x14" clear acrylic set in black rubber molding location as indicated on drawings.

- C. Bumpers: Cross-linked polyethylene.
- D. Provide means to adjust for proper perimeter clearance of each door leaf in relation to finished framework.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Doors and Frames: Install by factory-trained erectors in accordance with manufacturer's recommendations.

3.2 ADJUSTING AND CLEANING

- A. Adjusting: Adjust doors for smooth operation.
- B. Cleaning: Comply with Section 01770. Remove temporary protective coatings and strippable films after completion of installation.
 - 1. Clean after adjustment with mild soap and water using clean, soft, cloth, followed by dry wipe with clean, soft cloth.
 - 2. Do not use metal polish, abrasive materials, brushes, ammonia or strong alkali soaps before consulting with manufacturer and receiving their recommendations.

END OF SECTION 08380

SECTION 08411

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Entrances, storefront, and window systems, complete with reinforcing, fasteners, anchors, and attachment devices.
 - 2. Accessories necessary to complete work.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- D. Wind Loads: Provide storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.
 - 2. Static-Pressure Test Performance: Provide storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
- E. Dead Loads: Provide storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 - 1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
- F. Live Loads: Provide storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- G. Air Infiltration: Provide storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft..
- H. Water Penetration: Provide storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft.. Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- I. Thermal Movements: Provide storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, and other detrimental effects.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- J. Structural-Support Movement: Provide storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- K. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.
- L. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.
- M. Dimensional Tolerances: Provide storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.
- C. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- D. Cutaway Sample: Of each vertical-to-horizontal framing intersection of systems, made from minimum 6-inch lengths of full-size components and showing details of the following:
 1. Joinery.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of storefront systems with requirements based on comprehensive testing of current systems.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing storefront systems similar to those required for this Project and who is acceptable to manufacturer.
 1. Engineering Responsibility: Prepare data for storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of storefront system through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of storefront systems and are based on the specific systems indicated.
 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

- E. Mockups: Before installing storefront systems, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Construction Manager.
 - 2. Notify Construction Manager 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before proceeding with installation of systems.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including, but not limited to, excessive deflection.
 - 2. Failure of system to meet performance requirements.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Failure of operating components to function normally.
 - 5. Water leakage through fixed glazing and frame areas.
- C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers:
 - 1. Kawneer Company Inc.
 - 2. Oldcastle Building Envelope Products.
- B. Acceptable Products – Storefront Systems:
 - 1. Series Trifab VG 451T Thermal Flush Glaze, 2 inch by 4-1/2 inch, by Kawneer Company Inc.
- C. Acceptable Products -Doors:
 - 1. Series 500 Wide Stile with 10" bottom rail, by Kawneer Company Inc.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Bars, Rods, and Wire: ASTM B 211.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

- C. Glazing as specified in Division 8 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- F. Sealants and joint fillers for joints at perimeter of storefront systems as specified in Division 7 Section "Joint Sealants."
- G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS

- A. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners.
- C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

2.4 HARDWARE SETS

- A. Pair of exterior doors. Provide for each door leaf. (Refer to Drawings)
 - 1. Continuous hinge.
 - 2. Exit devices.
 - a. Acceptable Product: First Choice with cylinder dog down.
 - 3. Lock:
 - a. Acceptable Products:
 - 1) Adams Rite: MS-1850-S Deadlock.
 - 2) International Door Closers: FB-1201-K Flushbolt .
 - 4. Push and Pull: Custom, refer to Drawings.
 - 5. Closer.
 - a. Acceptable Product: LCN 4040.
 - 6. Weatherstripping.
 - 7. Threshold.
- B. Pair of interior doors. Provide for each door leaf. (Refer to Drawings)
 - 1. Continuous hinge.
 - 2. Push and Pull: Custom, refer to drawings
 - 3. Closer.
 - a. Acceptable Product: LCN 4040.
- C. Side Door. (Refer to Drawings)
 - 1. Continuous Hinge
 - 2. Exit Device.
 - a. Acceptable Product: First Choice with cylinder dog down.
 - 3. Lock.
 - a. Acceptable Product: Adams Rite: MS-1850-S Deadlock.
 - 4. Pull.
 - a. Acceptable Product: Custom, refer to drawings

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class I, Electrolytically deposited colored Anodic Finish: AA-M10 C22 A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611. Color as follows:
 - 1. Color for All Storefront Glazing Channels: #40 Dark Bronze Anodized.
 - 2. Color for Main Entry Doors/Entry Vestibule Doors: #28 Medium Bronze Anodized.
 - 3. Color for All Side Doors: #40 Dark Bronze Anodized.

2.7 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. 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 and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
- G. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- H. Erection Tolerances: Install storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field quality-control testing indicated.
- B. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.
- C. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 CLEANING

- A. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish and deliver all items of finish hardware required to adequately trim and hang all doors, as is hereinafter specified and listed in the hardware sets. This further includes hardware for doors and frames of unusual profile or shape or other special conditions. Hardware shall be provided with all necessary standard and special fasteners, screws, bolts, expansion shields or anchors to properly secure hardware to its intended door, frame or other surface.

1.3 REFERENCES

- A. The following documents should be used in estimating and detailing and considered as a standard of quality and performance, if applicable:
 1. I.B.C. International Building Code 2000 Edition.
 2. NFPA-80 Fire Doors & Windows (current year adopted).
 3. NFPA-101 Life Safety Code (current year adopted).
 4. NFPA-105 Smoke Control Door Assembly. (current year adopted)
 5. ANSI-117.1 1992 Edition Providing Accessibility and Usability for Physically Handicapped People.
 6. A.D.A.A.G Americans with Disabilities Act Accessibility Guidelines.

1.4 SUBMITTALS

- A. General Requirements: Make all submittals in accordance with Section 01300.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Product Data: Provide a catalog cut, clearly marked and identified, illustrating and describing each product included in the Hardware Schedule. Formulate these catalog cuts into sets and include a set with each copy of the Hardware Schedule submitted.

- D. Samples: If so requested by the Architect, provide a sample of any product or item requested, properly marked and tagged, for the opening for which it is intended.
- E. Templates: Provide copies of templates to manufacturers or trades whose work includes preparation of their products to receive hardware.
- F. Keying: Provide a keying schedule, listing the levels of keying, (GGMK, GKD, MKD or KA) as well as an explanation of the key system's function, the key symbols used and the numbers of the doors controlled. Provide in conjunction with the Door Index/Keying Schedule (which lists the door number, schedule heading, lock type and individual key symbol and remarks or special instructions) mentioned in above. Project shall be Master-keyed and/or Grand Master-keyed and provide 2 keys per lockset or cylinder.
- G. Operations and Maintenance Data: Provide latest, revised and updated schedule of finish hardware, complete with catalog cuts and keying schedule. In addition, furnish 1 copy of maintenance and parts manuals for those items for which they are readily available and normally provided. Submit in accordance with provisions of Section 01780.

1.5 QUALITY ASSURANCE

- A. Substitutions: Request for substitutions for alternative hardware items will not be accepted on this project. Specification indicates 1 specified and 1 or 2 acceptable alternative manufacturers' products listed hereinafter in the Hardware Schedule. If any specified product is listed as a "No Substitution" product, that specified product shall be supplied as specified.
- B. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. The hardware supplier shall be engaged regularly in the furnishing, delivery and servicing of contract builder's hardware and must be experienced and knowledgeable in all phases of estimating, detailing, scheduling, master-keying, shipping and installation practices.
 - 2. When electro-mechanical or electronic hardware is supplied, a qualified individual with a minimum 5 year's experience shall be available for assistance.
- D. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- E. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- F. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1.
- G. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2. Preliminary key system schematic diagram.
 - 3. Requirements for key control system.
 - 4. Address for delivery of keys.
 - 5. Location of Key Cabinet.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Marking and Packaging: All items of hardware shall be delivered to the jobsite in the manufacturer's original cartons or boxes. Each item of hardware shall be marked with the abbreviation set forth on the shop drawings to insure that the product reaches its installation destination without needing specific hardware product number knowledge.
- B. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- C. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies.

1.8 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: If there are any products listed hereinafter that normally require a maintenance or service contract, provide the Owner and Architect with details and costs of said contract.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Baldwin BALW
 - 2. Hager HGR
 - 3. McKinney MCK
 - 4. Pemko PEM
 - 5. Sargent SA
 - 6. Rockwood ROCK
 - 7. Stanley STA
 - 8. Ives IVES
 - 9. Lori LORI
 - 10. Von Duprin VON DUPRIN
 - 11. LCN LCN
 - 12.
- B. Approved Supplier for finish hardware:
 - 1. Piper-Weatherford Co., 214-343-9000.

2.2 MATERIALS

- A. Screws and Fasteners: Provide all screws and fasteners of the proper size and type to properly anchor or attach the item of hardware scheduled. Provide all fasteners with Phillips heads, unless security type screws (spanner-head or torx-head) are hereinafter specified.
- B. Hinges: Where hinges are specified, they shall be as follows:
 - 1. On doors to exterior openings and main corridor doors, and other doors of high frequency use, provide a continuous, gear type hinge of appropriate weight.
 - 2. Where regular ball bearing hinges are listed for other doors, provide one hinge for each 30-inch of door height.

3. The width of the hinges shall be sufficient to clear all trim that is mounted to the doorframe.
 4. Hinges shall be guaranteed for life of opening if installed per manufacturer's recommendation.
- C. Continuous Hinges: Continuous hinges shall consist of 3-interlocking extrusions in a pin-less assembly applied to the full height of the door. All continuous geared hinges shall be manufactured to template screw locations and be non-handed. All mortise hinges and half mortise hinges shall cover and wrap the door edge completely. Doorframe heads shall be extended for clearance on full or half mortise hinges versus downsizing doors for ease of repair and replacement. All frames shall be properly reinforced per manufacturer's standards.
1. Standard warranty shall be for the life of opening.
 2. Hinges shall be ANSI certified.
- D. Locks: All locks shall incorporate a seven-pin removable core tumbler system and be keyed to a GRANDMASTER SYSTEM as not to breach security of system. Keying system must be guaranteed of no duplication of existing change keys, master keys or grandmaster keys located in this project. All keying must be coordinated with architect/owner. All locks shall be Grade 1 mortise/cylindrical as is hereinafter listed in the Hardware Schedule.
- E. Electronic Lockset: This lock is to be heavy-duty lever handled, Grade 1, lockset for commercial, industrial and institutional applications. This lockset must combine key-in-lever design with motorized, programmable, stand-alone electronics for high security access control, which requires no external wiring.
- F. Lock Trim: Mortise/cylindrical locks are to be furnished with lever handle trim, with levers having a return to within 1/2 inch of the door face, as is hereinafter listed in the Hardware Schedule.
- G. Exit Devices: Exit Devices shall be rim, mortise or vertical rod type as called for in the Hardware Schedule. Devices shall be of the touch-pad type as is hereinafter specified in the Hardware Schedule. Exit devices must be constructed as to allow the cylinder to be removed and re-keyed, without removing the device from the door either by removable core cylinders or construction of exit device. Exit devices must be constructed as to allow the conversion from one function to another simply within lock stile case and selecting proper outside trim as specified hereinafter in the Hardware Schedule. Devices to be furnished with outside trim, which has matching lever handles to locks.
- H. Door Closers: Door closers shall be of cast iron and be of rectangular design and furnished with a full cover. They shall be furnished with back-check, delayed action and hold-open as listed in the Hardware Schedule. Closers shall be mounted out of the line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swinging doors. Mount closers top jamb or on brackets and/or drop plates, where special conditions call for it.
- I. Push Plates: Push plates are to be 0.050 brass, bronze or stainless steel with four (4) beveled edges, drilled and countersunk for screws, as is hereinafter specified in the Hardware Schedule.
- J. Door Pulls: Door pulls to be ADA compliant with a 2-1/2 inch projection from back of pull to face of door. All door pulls to be thru bolted or back-to-back mounting.
- K. Protective Plates: 0.050 brass, bronze or stainless steel, with 3 beveled edges, drilled and countersunk for screws. Mount plates to avoid louvers and glass kits.
1. Heights:
 - a. Mop: 6 inches.
 - b. Kick 10 inches.
 - c. Armor 34 inches.
- L. Door Stops and Holders: Where a door strikes a wall at approximately 90 degrees, a suitable door stop shall be provided, either a wall bumper or floor stop. Where doors are undercut, provide floor stops with adequate height to properly stop the door. If door does not strike a wall, an overhead stop shall be required. Provide proper blocking for wall bumpers at stud walls and in frame and door for overhead stops.

- M. Thresholds and Weatherstrip: Weatherstripping to have aluminum housing and specified insert, and have elongated holes. Door sweeps to be surface mounted of aluminum/stainless steel housing with specified insert. Overhead drip caps to be of aluminum, have a 2 1/2-inch projection and be 4 inches wider than the door opening. Thresholds shall be of saddle type with no more than 1/2 inch in rise. Weatherstripping and smoke seals must be surface mounted on doorstop and have 1/4" adjustment slots.
- N. Smoke Gasket: Smoke gasket shall comply with door and frame manufacturers for positive pressure tests for fire and smoke. (UL10C).

2.3 FINISHES

- A. Hardware finishes shall match and be maintained to BHMA symbols, as is specified hereinafter in the Hardware Schedule. Strict adherence to base metals and finish is required.

2.4 KEYING

- A. Keying of locks and cylinders throughout project shall be scheduled through a key meeting with Architect, Owner, and hardware supplier. Key schedule shall be prepared and submitted to the Owner for approval. Copies of final key schedule with the bitting instructions shall be submitted as part of the Project Record Documents.
- B. Key Quantities:
 - 1. Master Keys "AA": 6 each.
 - 2. Construction Master Keys: 4 each.
 - 3. 2 each keys for keyed different lock/cylinder.
 - 4. 2 each keys total for keyed alike lock/cylinder.
- C. Keying Schedule:
 - 1. Items that are keyed different and master keyed.
 - a. 1AA Single Door – Exterior from Receiving.
 - b. 2AA Single Door – Exterior from Mechanical Room.
 - c. 3AA Single Door – Kitchen to Office.
 - d. (4AA Single Door – Patio from Restaurant *****If applicable*****)
 - e. 5AA Single Door – Delivery Man Gate.
 - 2. Items that are keyed alike:
 - a. All Bus Stands, P.O.S., etc.
 - b. All Office Cabinets.
 - c. All Liquor Storage Cabinets.

2.5 KEY CONTROL

- A. Provide key cabinet(s) manufactured by of sufficient capacity to handle all keys, plus 50 percent expansion. Provide key control cross-reference chart and accountability (sign-out) tags.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

- A. Installation shall be by a qualified installer with a minimum 5 year's experience in the installation of commercial grade hardware. Manufacturer's instructions shall dictate templating and installation.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- C. 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 9 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.
- D. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

- A. A final inspection shall take place by the hardware installer and hardware supplier to insure correct installation and operation, and check for any damaged or defective items. Observe and inspect that all hardware has been installed to its correct destination in proper working order.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period 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.
- B. At completion of the installation and before turn over of the project, make final adjustments to door closures and other items of hardware. Leave all hardware clean and fully operable. Should any item be found to be defective, it shall be repaired or replaced as directed.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 HARDWARE SCHEDULE

- A. Refer to the drawings.

END OF SECTION 08710

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Glass glazing for hollow metal work, windows, storefront, doors, and millwork.
 - 2. Glazing accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with applicable code as measured in accordance with ANSI/ASTM E 330 unless indicated otherwise.
- B. Limit glass deflection to 1/175 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data:
 - 1. Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - 2. Provide data on glazing sealant. Identify colors available.
- C. Samples:
 - 1. Submit 2 samples, 12 by 12 inches in size, illustrating glass unit, coloration, design.
 - 2. Submit 4 inch long bead of glazing sealant in color selected.
 - 3. Submit sealed glass unit with manufacturer's certificate under provisions of Section 01450 indicating units meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with FGMA Glazing Manual.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.7 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop Drawings.

1.8 COORDINATION

- A. Coordinate Work under provisions of Section 01310.
- B. Coordinate Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.9 WARRANTY

- A. Provide 10 year manufacturer's warranty under provisions of Section 01780.
- B. Warranty: Include coverage for
 - 1. Delamination of laminated glass and replacement of same.
 - 2. Seal failure of insulated glass units.

PART 2 PRODUCTS

2.1 GLASS MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following, as applicable to following glass types.
 - 1. AFGD Industries, Inc., Atlanta, GA.
 - a. Contact: Scott Hoover, 800-766-2343.
 - 2. Libby-Owens-Ford (LOF), Toledo, OH.
 - 3. PPG Industries, Inc., Pittsburgh, PA.
 - 4. Spectrum Glass Products.
 - 5. Interpane Glass Company, Clinton, NC.
 - 6. Viracon, Owatonna, MN.
- B. Substitutions: Under provisions of Section 01600.

2.2 GENERAL

- A. Heat strengthened or tempered glass lights as required by code and as recommended by manufacturer complying with ASTM C 1048 and ANSI Z97.1.
- B. Temper units without tong marks.
- C. Glass unit thicknesses are indicated as minimums, to be increased as required by wind loading and spans encountered. Glass manufacturer to prepare loading and span calculations to document thickness of glass.

2.3 GLASS MATERIALS

- A. Glass Type GL-1 - Float Glass:
 - 1. ASTM C 1036, glazing select quality.
 - 2. Thickness: 1/4 inch minimum.
- B. Glass Type GL-2 - Safety Glass:
 - 1. ASTM C 1048, glazing select quality; Kind FT, fully tempered.
 - 2. Thickness: 1/4 inch minimum.
- C. Glass Type GL-3 – Low-E Insulated Tinted Glass:
 - 1. ASTM C 1036, glazing select quality.
 - 2. Visible Light Transmittance: 40 percent.
 - 3. Color: Low-E Sungate 500, Solargray by PPG.
 - 4. Outer Pane: 1/4 inch thick minimum, Solargray.
 - 5. Low-E Coating: Sungate 500 (3) I.G. Unit.
 - 6. Inner Pane: 1/4 inch thick minimum, clear.
 - 7. Air Space: Interpane space purged dry air, 1/2 inch.
 - 8. Total Thickness: 1 inch total.
 - 9. Fully temper per ASTM C 1048 in doors and elsewhere as required by referenced codes.
- D. Glass Type GL-4 – Insulated Glass Units – Clear:
 - 1. Meeting Class A requirements of ASTM E 774 when tested in accordance with ASTM E 773.
 - 2. Double pane with glass elastomer edge seal; tempered.
 - 3. Outer Pane: 1/4 inch thick minimum, clear.
 - 4. Inner Pane: 1/4 inch thick minimum, clear.
 - 5. Air Space: Interpane space purged dry air, 1/2 inch.
 - 6. Total Thickness: 1 inch total.

- E. Glass Type GL-5 - Insulated Glass Units - Tinted:
 - 1. Meeting Class A requirements of ASTM E 774 when tested in accordance with ASTM E 773.
 - 2. Double pane with glass elastomer edge seal, tempered.
 - 3. Outer Pane: 1/4 inch thick minimum glass, Type GL-3, tinted.
 - 4. Inner Pane: 1/4 inch thick minimum glass, clear.
 - 5. Air Space: Interpane space purged dry air.
 - 6. Total Unit Thickness: 1 inch minimum.
- F. Glass Type GL-6 – Not Used:
- G. Glass Type GL-8 – Not Used
- H. Glass Type GL-9 - Plexiglas:
 - 1. Thicknesses: 1/4 inch.
 - 2. Type: Clear, abrasion resistant, polycarbonate plastic.
 - 3. Acceptable Products:
 - a. Tuffak-CM2 by Altuglas International, Pittsburgh, PA.
 - b. Margard by General Electric Company, Pittsfield, MA.
- I. Glass Type GL-10 – Anti-Reflective Glass:
 - 1. Thickness: 1/4 inch.
 - 2. Single-sided coating.
 - 3. Acceptable Products:
 - a. Luxar by Abrisa, Santa Paula, CA
 - b. AFGD Industries. Inc.

2.4 GLAZING COMPOUND MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Pecora Corp.
 - 2. General Electric.
 - 3. Dow Corning.
- B. Substitutions: Under provisions of Section 01600.

2.5 GLAZING COMPOUNDS

- A. Glazing Compound: FS TT-G-410; grey color.
 - 1. Acceptable Products:
 - a. M251 by Pecora Corporation.
 - b. Dap Flexiglaze 1231 Glazing Compound by Dap, Inc.
- B. Butyl Sealant: FS TT-S-001657; Shore A hardness of 10- 20; black color; non-skinning.
- C. Silicone Sealant: FS TT-S-00230C, Type II, Class A; single component; non-sag, capable of water immersion without loss of properties; cured Shore A hardness of 5; color as selected by Architect.
 - 1. Acceptable Products:
 - a. 999 by Dow Corning.
 - b. Silicone 1200 Construction Sealant by General Electric.

2.6 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene; 70 to 90 Shore A durometer hardness; 4 inch long by 3/8 inch wide by 1/4 high.
- B. Spacer Shims: Neoprene; 50 Shore A durometer hardness; 3 inch long by 1/4 inch wide by 1/4 inch thick; self adhesive one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
 - 1. Acceptable Products:
 - a. Tremco 440 Tape by Tremco.
 - b. G-66 or BB-50 by Pecora Corporation.

- D. Glazing Splines: Resilient polyvinylchloride extruded shape to suit glazing channel retaining slot, meeting ASTM D 1667.
- E. Glazing Clips: Manufacturer's standard type.
- F. Setting Angles: 0.060 inch aluminum z-clips on T-angles sized as required.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.
- B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses.
- C. Prime surfaces scheduled to receive sealant.
- D. Carefully measure glass openings and provide minimum required tolerances and clearances.

3.3 GENERAL

- A. Comply with manufacturers' recommended installation procedures and as outlined herein.
- B. Prevent nicks, abrasions and other damage likely to develop stress on edges.
- C. Comply with CPSC and MSGC for provisions of tempering of glass in and near doors and adjacent to walking surfaces, unless local codes are more stringent.

3.4 EXTERIOR DRY METHOD - PREFORMED GLAZING

- A. Cut glazing spline to length; install on glass pane. Seal corners by butting tape and dabbing with butyl sealant.
- B. Place setting blocks at 1/4 points.
- C. Rest glass on setting blocks and push against fixed stop with sufficient pressure to attain full contact at perimeter of pane.
- D. Install removable stops without displacement of glazing spline. Exert pressure for full continuous contact.
- E. Trim protruding tape edge.

3.5 EXTERIOR COMBINATION METHOD - TAPE AND SEALANT

- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sightline. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bed of butyl sealant along exterior void ensuring full contact with pane.
- C. Place setting blocks at 1/4 points.
- D. Rest glass on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane.
- E. Install removable stops, spacer strips inserted between glass and applied stops at 24 inch intervals, 1/4 inch below sightline.
- F. Fill gap between pane and applied stop with sealant to depth equal to bite of frame on pane, but not more than 3/8 inch below sightline.
- G. Apply cap bead of sealant along exterior void, to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth appearance.

3.6 EXTERIOR WET METHOD - SEALANT AND SEALANT

- A. Place setting blocks at 1/4 points and install glass pane.
- B. Install removable stops with pane centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sightline.
- C. Fill gap between pane and stops with sealant to depth equal to bite of frame on pane, but not more than 3/8 inch below sightline.

- D. Apply sealant to uniform line, flush with sightline. Tool or wipe sealant surface with solvent for smooth appearance.
- 3.7 INTERIOR DRY METHOD - TAPE AND TAPE
- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.
 - B. Place setting blocks at 1/4 points.
 - C. Rest glass on setting blocks and push against tape for full contact at perimeter of pane.
 - D. Place glazing tape on free perimeter of pane in same manner described above.
 - E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
 - F. Knife trim protruding tape.
- 3.8 INTERIOR COMBINATION METHOD - TAPE AND SEALANT
- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sightline.
 - B. Place setting blocks at 1/4 points.
 - C. Rest glass on setting blocks and push against tape to ensure full contact at perimeter of pane.
 - D. Install removable stops, spacer shims inserted between glass and applied stops at 24 inch intervals, 1/4 inch below sightline.
 - E. Fill gap between pane and applied stop with sealant to depth equal to bite of frame on pane to uniform and level line.
 - F. Trim protruding tape edge.
- 3.9 INTERIOR WET METHOD - COMPOUND AND COMPOUND
- A. Install glass resting on setting blocks, spaced at 1/4 points. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sightline.
 - B. Locate and secure glass pane using spring wire clips.
 - C. Fill gaps between pane and stops with glazing compound until flush with sightline. Tool surface to straight line.
- 3.10 CLEANING/PROTECTION
- A. After installation, mark pane with an "X" by using plastic tape or removable paste.
 - B. Clean all surfaces of glazing materials, mortar, plaster, paint and other soiling or contaminates.
 - C. Remove labels after work is completed.
 - D. Wash and Polish both faces not more than one week prior to Owners acceptance of work.
 - E. Replace broken, scratched, chipped, or otherwise damaged glass.
- 3.11 TESTING OF EXTERIOR GLAZING SYSTEMS
- A. After completion of exterior glazing and nominal curing of sealants, test same from the exterior for water leaks. Apply a stream of water perpendicularly from a 3/4 inch hose at normal domestic water pressure. Conduct tests in the presence of Construction Manager who shall determine the actual percentage of joints to be tested and the period of waterflow exposure, based on any evidence of leakage. Repair leaks and other defects, and retest as directed. Repair or replace other work damaged by such leaks.

END OF SECTION

SECTION 09120

METAL SUSPENSION SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Suspension System Framing and Furring for Plaster and Gypsum Board Assemblies
 - 2. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Section 09250 - Gypsum Board
 - 2. Section 09150 - Acoustical Ceilings
 - 3. Division 15 Sections - Mechanical Work
 - 4. Division 16 Sections - Electrical Work
- C. Alternates
 - 1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.
 - 2. Submittals, which do not provide adequate data for the product evaluation, will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Furring System component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
 - 4. ASTM D 610 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
 - 5. ASTM B 117 Standard Practice for Operating Salt Spray (Fog) Apparatus
 - 6. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 7. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 8. ASTM C 645 Standard Specification for Nonstructural Steel Framing Members
 - 9. ASTM C 754 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board
 - 10. ASTM C1002 Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
 - 11. ASTM E 119 Standard Test Method for Fire Tests of Building Construction and Material (if applicable).

12. NOA #07-0119.02 Miami/Dade Wind Uplift.
13. NAO #09-0512.02 Miami/Dade Impact.
14. ESR-1289 ICC-ES Evaluation Report.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical literature.
- B. Samples: 8 inch long samples of suspension system components, including main runner, cross tees and angle molding.
- C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: To ensure proper interface, all drywall furring components shall be produced or supplied by a single manufacturer.
- B. All accessory components from other manufacturers shall conform to ASTM standards.
- C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings function as a fire protective membrane and tested per ASTM E 119. Installation in accordance with the UL Design being referenced.
- D. Coordination of Work:
 1. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
 2. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

1.7 WARRANTY

- A. Suspensions System: Submit a written limited warranty executed by the manufacturer, agreeing to repair or replace grid components that are supplied with a hot-dipped galvanized coating or aluminum base material. Failures include, but are not limited to:
The occurrence of 50% red rust as defined by ASTM D 610 test procedures as a result of defects in materials or factory workmanship.
- B. Warranty Period:
Grid: Ten years from date of installation.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Acceptable Products and Manufacturers:
 1. Armstrong World Industries, Inc.
- B. Substitutions: Submit under provisions of Section 01600.

2.2 SUSPENSION SYSTEMS

- A. Components:
 1. Main Beam: Shall be double-web construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (per ASTM A653).

- a. 1-11/16 inch web height, 1-1/2 inch flange, available with G40 or G90 hot dipped galvanization.
 2. Primary Cross Tees: Shall be double-web steel construction (minimum 0.0179 inch prior to protective coating, ASTM C645), hot dipped galvanized (minimum G40 or G90 per ASTM A653)
 - a. 48 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange
 - b. 24 inch web height 1-1/2 inch with rectangular bulb and pre-finished 1-1/2 inch knurled flange.
 3. Wall Molding:
 - a. 12 foot Locking Angle Molding, 1-1/4 inch x 1-1/4 inch with pre-engineered locking tabs punched 8 inches on center, knurled surface, screw stop hem, pre-punched holes in top flange, 4" O.C., .018 mil. 25g.
 4. Clips:
 - a. Main Beam Adapter Clip
 - b. Transition Clip for 5/8" drywall with Locking Tabs.
 - c. Main Beam Spacer Clip.
 - d. Adjustable Grid Spacer Clip, 12 inch.
 - e. Cross Tee Adapter Clip.
 - f. Direct Load Ceiling Clip.
 - g. Drywall Clip.
 - h. Single Tee Adapter Clip
 5. Screws for wallboard application shall be bugle head screws in accordance with thickness of material used.
 6. Metal Trim or Plastic Members (by others):
 - a. Corner bead: Minimum #26 gauge, zinc alloy or plastic square edge type with expanded flanges.
 - b. Casing bead: Minimum #24 gauge, zinc alloy or plastic square edge type with expanded flanges.
 - c. Control Joints: Minimum #26 gauge, roll-formed zinc alloy, extruded aluminum or plastic with expanded flanges.
 - d. Special Trim Shapes: As detailed on plans, extruded aluminum with acrylic coating by Fry Reglet or approved equal.
 - e. Metal Lath: 3.4 lbs/square yard, galvanized 3/8 inch diamond mesh or flat rib lath; security lath for applications requiring high degree of security.
- B. Structural Classification:
1. Main Beam shall be heavy duty per ASTM C 635.
 2. Classification can require wires to be closer together for additional loading when used to support double layer gypsum, verticals, slopes, domes, half barrels, circles, soffits, canopies, and step conditions which call for loading or unusual designs and shapes in drywall construction. Using cross tees in the construction of circles, barrels, etc. is common in order to hold the radius.
 3. Deflection of fastening suspension system supporting light fixtures, ceiling grilles, access doors, verticals and horizontal loads shall have a maximum deflection of 1/360 of the span.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install suspension system and panels in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
- B. The Armstrong Drywall Grid System can be installed in interior or exterior applications.
- C. To secure to metal clips, concrete inserts, steel bar joist or steel deck, use power actuated fastener, or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.

- D. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures, grilles, and access doors where necessary. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
- E. Add additional wire as needed when using compatible clips and accessories.
- F. Control Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
- G. Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction as shown on drawings.
- H. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.
- I. Install cross tees at on center spacing as specified by the drywall manufacturer. Typical drywall cross tee spacing:
 - 1. 24 inches on center with 5/8 inch gypsum board
- J. Other items such as wood, sheet metal, or plastic panels should be screwed to comply with deflection limit equivalent to that of the ceiling installation.
- K. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.
- L. To suspend a second ceiling beneath a new or existing drywall ceiling, without breaching the integrity of the upper ceiling, use the Drywall Clip. To form a transition from a drywall ceiling to an acoustical ceiling, use the Drywall Transition Clips spaced as required for expected loads.
- M. For light fixtures use secondary framing cross tees as required to frame opening.
- N. Single cross tees in a route hole to be secured by 7/16 inch framing screw or alternative methods.
- O. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.
- P. Additional bracing as required by code.

END OF SECTION

SECTION 09250

GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Refer to Section 09120 for Gypsum Suspended ceiling system components.
- C. Section Includes:
 - 1. Gypsum board.
 - 2. Cementitious backer board.
 - 3. Taped and sanded joint treatment.
 - 4. Acoustical insulation.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01330.
- B. Product Data: Provide data on gypsum board, joint tape and joint compound.
- C. Submit manufacturer's installation instructions for each product proposed for use.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C 840, GA-201, GA-216 and GA-600.

1.4 DELIVERY, STORAGE, HANDLING

- A. Deliver, store, handle, and protect products in conformance with manufacturer's instructions and in accordance with Section 01600.
- B. Store inside building, on sleepers, and out of water.

1.5 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated assemblies.
- B. Refer to Drawings for details and references to UL and GA assemblies.

PART 2 PRODUCTS

2.1 MANUFACTURERS - GYPSUM BOARD

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Domtar Gypsum Co.
 - 2. Georgia Pacific.
 - 3. National Gypsum.
 - 4. Republic Gypsum Co.
 - 5. U. S. Gypsum Company.
- B. Substitutions: Under provisions of Section 01600.
- C. Specific product references are these of U.S. Gypsum Company unless noted otherwise as a standard of quality.

2.2 GYPSUM BOARD MATERIALS

- A. Fire Rated Gypsum Board: ASTM C 36; fire resistive type X or C, UL rated; 48 inch by 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled edges.
- B. Moisture Resistant Gypsum Board: ASTM C 630; 48 by 5/8 inch thick, type X or C (fire-rated), maximum permissible length ends square cut, tapered edges.
- C. Gypsum Backing Board: ASTM C 442; fire rated type 'X'; 5/8 inch thick; V-grooved edges, ends square cut, maximum permissible length.
- D. Gypsum Sheathing Board: ASTM C 79; moisture resistant type; fire-resistant, 1/2 inch thick, maximum permissible length; ends square cut, tongue and grooved edges; water repellent paper faces.
- E. Gypsum Core Board: ASTM C 442; 1 inch thick, type 'X', maximum permissible length; square edges, ends square cut.
- F. Exterior Gypsum Ceiling Board: ASTM C 931; fire rated type 'X' type, 5/8 inch thick, maximum permissible length; ends square cut, tapered and beveled edges.
- G. Cementitious Backing Board: High density, glass fiber reinforced, 1/2 inch thick; 2 inches wide, coated glass fiber tape for joints and corners.
 - 1. Acceptable Product: Durock Tile backer board manufactured by U.S. Gypsum Co.

2.3 ACCESSORIES

- A. Fasteners: ASTM C514 for nails and C1002 for screws as follows:
 - 1. Inserts, clips, bolts, nails or other screws as recommended by wallboard manufacturer, of type and size to suit application and to rigidly secure materials in place.
 - 2. Screws: Type S or S 12, bugle head screws, self drilling, self tapping.
 - 3. Nails: Annular ringed type, conforming to ASTM C 380, 1-5/8 inches long for single layer of 1/2 inch thick gypsum board, 1-7/8 inches long for 5/8 inch thick gypsum board, and 2-3/8 inches long for laminated construction. Verify the above is in conformance with requirements of governing authorities.
- B. Resilient Channels: Formed steel; minimum 25 gage thick; size and length as required, serrated face, hat shaped profile; equal to U.S.G. model RC 1.
- C. Adhesive: ASTM C 557, "Durabond 500" over wood framing.
- D. U. S. Gypsum Company products specified below as a standard of quality, unless noted otherwise.
 - 1. Acoustical Insulation: Refer to Section 07210.
 - 2. Acoustical Sealant and Tape: Non-hardening, non-skinning, for use in conjunction with gypsum board; manufactured by Tremco, Pecora, or USG.
 - 3. Corner Beads: Metal, Durabead No. 103, galvanized.
 - 4. Casing Beads: No. 200-A, galvanized.
 - 5. Control Joint: No. 093, galvanized.
 - 5. Hanger Wire: Annealed galvanized wire, of gauges indicated (or required to suit application) to rigidly support ceiling components in place.
- E. Joint Treatment Materials
 - 1. Joint Tape:
 - a. ASTM C 475 or FS SS-J-570, Type II, perforated tape.
 - b. Lightly pre-creased for corner application.
 - 2. Joint Compound:
 - a. ASTM C 475 or FS SS-J-570, Type I.
 - 3. Acceptable Products:
 - a. Taping Compound: USG Durabond Joint Compound Taping.
 - b. Topping: USG Joint Compound - All Purpose.
 - 4. Joint Compound-Taping (Ready-Mixed or Powder): Non-asbestos vinyl-based formulations:
 - a. For embedding tape and as first and fill coat over metal beads, trims and fasteners over the following:
 - 1) Regular gypsum board.
 - 2) Fire code gypsum board.
 - 3) Gypsum sheathing.
 - 4) Fire code gypsum sheathing.

- b. Not for use in wet or exterior locations.
- 5. Joint Compound-Topping (Ready-Mixed or Powder): Non-asbestos vinyl-based formulation:
 - a. For second and third coats over taping compound and for simple texturing or skim coating over the following:
 - 1) Regular gypsum board.
 - 2) Fire code gypsum board.
 - 3) Water-resistant gypsum board:
 - b. For second and third coats over panel joints, internal angles and fasteners at non-tiled wall surfaces only.
 - 1) Water-resistant fire code gypsum board:
 - c. For second and third coats over panel joints, internal angles and fasteners at non-tiled wall surfaces only.
 - 1) Gypsum sheathing.
 - 2) Fire code gypsum sheathing.
- 6. Water-Resistant Joint Compound:
 - a. For embedding tape, as first fill coat over metal beads, trims and fasteners, as second coat over reinforcing tape, and to fill all openings around pipes, fittings and fixtures over the following.
 - 1) Water resistant gypsum board:
 - i) For first and fill coats over metal beads, trims and fasteners at non-tiled wall surfaces only.
 - ii) For first and fill coats over metal beads, trims and fasteners and second coat at tiled surfaces only.
 - 2) Water-resistant fire code gypsum board:
 - i) For first and fill coats over metal beads, trims and fasteners at non-tiled wall surfaces only.
 - ii) For first and fill coats over metal beads, trims and fasteners at tiled wall surfaces only.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing substrate.

3.2 ACOUSTICAL ACCESSORIES INSTALLATION

- A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- B. Install acoustical sealant at wall perimeter of designated partitions as follows:
 - 1. Framing: Two beads at contact area at intersecting walls, floors and ceilings.
 - 2. Base Layer Gypsum Board: One bead.
 - 3. Seal penetrations of partitions by conduit, pipe, ductwork, rough-in boxes, and access door frames.

3.3 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201, GA 216, GA-600 and U.S.G. "Gypsum Construction Handbook".
- B. Erect board vertically, except that board may be erected horizontally for curved walls, with ends and edges occurring over firm bearing. Stagger end joints to occur at different locations on opposite sides of wall. Apply board to suspended ceilings with long dimension at right angles to framing.

- C. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing. Abut boards without forcing. Neatly fit ends and edges of boards and make cuts and penetrations so that paper facing and gypsum core are not damaged.
- D. Use screws when fastening gypsum board to metal furring and nails to wood studding. Stagger fasteners opposite each other on adjacent ends and edges. Space fasteners as recommended in U.S.G., "Gypsum Construction Handbook".
- E. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
- F. Install cementitious backing board over stud framing in accordance with manufacturer's instructions.
- G. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.
- H. Place control joints at changes in back-up material, at maximum 20'-0" off center in exterior walls, and at maximum 30'-0" off center at interior partitions. In ceilings, install at maximum 30'-0" off center each way. Provide fire resistant protections behind control joints in fire rated assemblies.
- I. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- J. On fire rated assemblies, seal penetrations and make air-tight. Refer to Section 07840 for firestopping requirements and materials.
- K. Thicken partitions to eliminate wall surface jogs for the full length of the wall within a room to conceal structural members, pipes, panels, specialty items, and accessories.
- L. Coordinate door and other frame thicknesses as required.

3.4 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce surface ready to receive finishes. The intent is to provide the highest quality of joint treatment work consistent with commercial construction. Leave surfaces smooth, uniform, and free of fins, depressions, ridges, cracks, and other imperfections.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Levels of Finish:
 - 1. Comply with GA-214; italicized commentary is excluded; replace words "may" and "should" with "shall."
 - 2. Locations to receive Level 4 finish: Areas to be painted.
 - 3. Locations to receive Level 3 finish: Areas to receive moisture resistant gypsum board used as a tile substrate.
 - 4. Locations to receive Level 2 finish: Fire-rated, sound-rated, and smoke-rated assemblies in ceiling plenums and concealed areas.
 - 5. Locations to receive Level 1 finish: Non-fire-rated, non-sound-rated, and non-smoke-rated assemblies in ceiling plenums and concealed areas.
- D. Textured Finish Application:
 - 1. Apply textured finish to drywall panels as shown and indicated on Drawings.
 - 2. Apply smooth finish by means of hand troweling to a minimum thickness of 1/8 inch throughout the surface and a maximum thickness of 1/4 inch at its high points.

3.5 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09300

TILE

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Ceramic and porcelain tile floor, base, and wall surfacing, installed using the thin-set method, with cementitious grouted joints, and waterproofing where noted.
 - 2. Synthetic marble thresholds in wall openings.
 - 3. Exterior applications of tile.

1.2 SUBMITTALS

- A. Submit shop drawings, product data, and samples under provisions of Section 01330.
- B. Shop Drawings:
 - 1. Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
 - 2. Locate and detail expansion and control joints.
- C. Submit product data, specifications, and instructions for using mortars, adhesives and grouts.
- D. Samples:
 - 1. Submit color samples illustrating full color range of each type tile.
 - 2. Submit representative color samples of each type grout.
 - 3. Upon final selection, submit tile mock-up mounted on a plywood backer board, illustrating tile patterns and colors, grout joint width and colors, and maximum color variations anticipated. Size of mock-up to allow for at least 4 tiles with a minimum overall size of 12 inches by 12 inches.
 - 4. Grout: Submit samples mounted in 6-inch long metal channels for each type and color specified.
 - 5. Elastomeric Membrane: Submit 12 inch by 12 inch sample.
 - 6. Trim: Submit sample of each type and color.
 - 7. Threshold: Submit full profile sample, 6 inches long, of each type.
- E. Submit following Informational Submittals:
 - 1. Certifications specified in Quality Assurance article.
 - 2. Qualification Data: Manufacturer's and installer's qualification data.
 - 3. Manufacturer's instructions.
- F. Closeout Submittals:
 - 1. Submit under provisions of Section 01780.
 - 2. Maintenance Data: Include stain removal methods.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain each type and color tile material required from single source.
 - 2. Obtain setting and grouting materials from one manufacturer to ensure compatibility.
 - 3. Obtain elastomeric membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.
- B. Manufacturer Qualifications:
 - 1. Tile: Minimum 5 years experience in manufacture of tile products.
 - 2. Setting Materials: Minimum 10 years experience in manufacture of setting and grout materials specified.
 - 3. Elastomeric Membrane: Minimum 5 years experience in manufacture of membrane materials specified.
- C. Installer Qualifications: Specializing in tile work having minimum of 5 years successful documented experience with work comparable to that required for this Project.

- D. Certifications:
 - 1. Submit "Master Grade Certificate" for each type of ceramic and paver tile in accordance with requirements of ANSI A137.1.
 - 2. Submit manufacturer's certifications that mortars, adhesives, and grouts are suitable for intended use.
 - E. Conform to ANSI - Recommended Standard Specifications for Ceramic Tile - A137.1.
 - F. Conform to TCNA Ceramic Tile: The Installation Handbook.
- 1.4 FIELD SAMPLES
- A. General: Comply with provisions of Section 01450.
 - B. Sample Installation:
 - 1. For final review of each type tile, construct sample panel of approximately 100 square feet.
 - 2. Install in location as directed by Construction Manager.
 - 3. Show workmanship of finished work and construction techniques.
 - C. Approved field samples may remain as a part of the Work.
- 1.5 PRE-INSTALLATION CONFERENCE
- A. Conduct pre-installation conference in accordance with Section 01310.
 - B. Convene one week prior to commencing work of this section.
 - C. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
 - D. Meeting agenda includes but is not limited to:
 - 1. Surface preparation.
 - 2. Tile and installation material compatibility.
 - 3. Elastomeric membrane.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Comply with requirements of Section 01600.
 - B. Labeling: Comply with ANSI A137.1.
 - C. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
 - D. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
 - E. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.
 - F. Protect mortar and grout materials against moisture, soiling, or staining.
- 1.7 ENVIRONMENTAL REQUIREMENTS
- A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
 - B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.
 - C. Ventilate spaces receiving tile in accordance with material manufacturers' instructions.
- 1.8 WARRANTY
- A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: 2 years after date of Substantial Completion.
- 1.9 EXTRA MATERIALS
- A. At completion of project, deliver to Owner extra stock of materials used on project as follows:
 - 1. One carton of each color and size of floor, base, and wall tile.
 - B. Store in location as directed by Construction Manager.
 - C. Ensure materials are boxed and identified by manufacturer, type, and color.

1.10 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Section 01780.
- B. Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

PART 2 PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.
 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
 2. Provide tile trim and accessories that match color and finish of adjoining flat tile unless noted otherwise.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.
 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of uses and has been successfully used on other projects.

2.2 CERAMIC TILE

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
 1. American Olean Tile Company, Dallas, TX.
 2. Dal-Tile Corp., Dallas, TX.
 3. American Marrazi Tile, Dallas, TX
 4. Interceramic, USA, Garland, TX.
 5. Florida Tile, Lakeland, FL.
 6. Lone Star Ceramics Mfg. Co., Dallas, TX.
 7. Cerim-Flor Gres Specialty Tile, Atlanta, GA.
 8. Substitutions: Submit in accordance with Section 01600.

2.3 FLOORING TILE AND BASES

- A. **FT-1/B-3 – PORCELAIN TILE**
 1. Concrete Connection as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 Attn: Whitney Welch
 2. Size: 20 inches by 20 inches nominal.
 3. Edges: Cushioned.
 4. Joint Space: 1/8 inch.
 5. Location: As noted on drawings.
 6. Color: City Elm CN92
 7. **Grout: As indicated on Drawings.**
 8. Base Tile (B-3): 6 inches by 20 inches.
- B. **FT-2 – MOSAIC TILE**
 1. New Mosaics as manufactured by StonePeak Ceramics 314 W. Superior, Chicago, IL 60654 (321)-506-2800
 2. Size: 1 inches by 2 inches brick pattern, mesh-mounted on 12"x12" sheets..

3. Location: As noted on drawings.
 4. Color: Design 5 – USG12 MB704.
 5. **Grout: As indicated on Drawings.**
- C. **FT-3 – PORCELAIN TILE**
1. Cottage as manufactured by StonePeak Ceramics 314 W. Superior, Chicago, IL 60654 (321)-506-2800
 2. Size: 6 inches by 24 inches nominal.
 3. Edges: Cushioned.
 4. Joint Space: 1/8 inch.
 5. Location: As noted on drawings.
 6. Color: Mountain Retreat.
 7. **Grout: As indicated on Drawings.**

2.4 QUARRY TILE AND BASES

- A. **FT-4/B-2 – QUARRY TILE AND BASE**
1. "Quarry Tile" as manufactured by Dal-Tile Corporation, Richardson, Texas 75081, (800)-486-5724 Attn: Whitney Welch
 2. Conformance: ANSI A137.1-1980 Ceramic Tile, Section 7.
 3. Color: Storm Gray.
 4. Size: 6 inch by 6 inch by tile thickness.
 5. Surfacing: Dal-tile "Suretread" (to be installed in walkways).
 6. Smooth: To be installed under kitchen equipment area.
 7. Edges: Square.
 8. Joint Space: 1/4 inch.
 9. Location: As detailed on the Drawings.
 10. Grout: As indicated on Drawings.
 11. Trims:
 - a. Cove-Round Top Bases: 5 inch by 6 inch by 1/2 inch thick.
 - b. Stretchers.
 - c. Outside corners with and without returns.
 - d. Inside corners.
 - e. Bullnose at slab edge: 6 inch by 6 inch by tile thickness:
 - f. Stretchers.
 - g. All other required trims for a complete installation.
- B. **FT-5/B-2 – QUARRY TILE AND BASE**
1. "Quarry Tile" as manufactured by Dal-Tile Corporation, Richardson, Texas 75081, (800)-486-5724 Attn: Whitney Welch
 2. Conformance: ANSI A137.1-1980 Ceramic Tile, Section 7.
 3. Color: Black.
 4. Size: 6 inch by 6 inch by tile thickness.
 5. Surfacing: Dal-tile "Suretread" (to be installed in walkways).
 6. Smooth: To be installed under kitchen equipment area.
 7. Edges: Square.
 8. Joint Space: 1/4 inch.
 9. Location: As detailed on the Drawings.
 10. Grout: As indicated on Drawings.
 11. Trims:
 - a. Cove-Round Top Bases: 5 inch by 6 inch by 1/2 inch thick.
 - b. Stretchers.
 - c. Outside corners with and without returns.
 - d. Inside corners.
 - e. Bullnose at slab edge: 6 inch by 6 inch by tile thickness:
 - f. Stretchers.
 - g. All other required trims for a complete installation.

2.5 BASES

- A. **B-4 – MOSAIC BASE**

1. Keystones Mosaic Tile as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 attn: Whitney Welch
 2. Size: 1 inches by 1 inches nominal, mesh-mounted on 12"x24" sheets.
 3. Location: As noted on drawings.
 4. Color: D311 Black.
 5. Grout: Mapei #10, Black
- B. **B-5 – TILE BASE**
1. Parkland as manufactured by StonePeak Ceramics 314 W. Superior, Chicago, IL 60654 (321)-506-2800
 2. Size: 12 inches by 24 inches nominal.
 3. Joint Space: 1/8 inch.
 4. Location: As noted on drawings.
 5. Color: Acadia – USG1224041.
 6. Grout: Mapei #10, Black

2.6 WALL TILE

- A. **WT-1 – WALL TILE**
1. Modern Dimensions as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 attn: Whitney Welch
 2. Size: 4.25 inches by 8.5 inches nominal.
 3. Joint Space: 1/8 inch.
 4. Location: As noted on drawings.
 5. Color: K175 Biscuit
 6. Finish: Glazed
 7. **Grout: As indicated on Drawings.**
- B. **WT-2 – WALL TILE**
1. Modern Dimensions as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 attn: Whitney Welch
 2. Size: 4.25 inches by 8.5 inches nominal.
 3. Joint Space: 1/8 inch.
 4. Location: As noted on drawings.
 5. Color: 0190 Artic White
 6. Finish: Glazed
 7. **Grout: As indicated on Drawings.**
- C. **WT-3 – WALL TILE**
1. Modern Dimensions as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 attn: Whitney Welch
 2. Size: 4.25 inches by 12.75 inches nominal.
 3. Joint Space: 1/8 inch.
 4. Location: As noted on drawings.
 5. Color: Custom ODM1 Vermillion
 6. Finish: Glazed
 7. **Grout: As indicated on Drawings.**
- D. **WT-4 – MOSAIC WALL TILE**
1. Keystones Mosaic Tile as manufactured by Dal-Tile Corporation, Richardson, Texas 75081 (800)-486-5724 attn: Whitney Welch
 2. Size: 1 inches by 1 inches nominal, mesh-mounted on 12"x24" sheets.
 3. Location: As noted on drawings.
 4. Color: D311 Black.
 5. **Grout: As indicated on Drawings.**
- E. **WT-5 – WALL TILE**
1. Parkland as manufactured by StonePeak Ceramics 314 W. Superior, Chicago, IL 60654 (321)-506-2800
 2. Size: 12 inches by 24 inches nominal.
 3. Joint Space: 1/8 inch.
 4. Location: As noted on drawings.
 5. Color: Acadia – USG1224041.
 6. **Grout: As indicated on Drawings.**

- F. **WT-6 – WALL TILE**
 - 1. Parkland as manufactured by StonePeak Ceramics 314 W. Superior, Chicago, IL 60654 (321)-506-2800
 - 2. Size: 24 inches by 24 inches nominal.
 - 3. Joint Space: 1/8 inch.
 - 4. Location: As noted on drawings.
 - 5. Color: Acadia – USG1224041.
 - 6. **Grout: As indicated on Drawings.**
- G. **WT-7 – CUSTOM MIRROR TILE**
 - 1. Size: 3" x 6" custom mirror tile with ½" bevel all four edges.
 - 2. Joint Spacing: Butt joint.
 - 3. Grout: None
 - 4. Location: Top of low walls.

2.7 THRESHOLDS

- A. Synthetic Stone Thresholds
 - 1. Type: Synthetic marble type.
 - 2. Color: To be selected.
 - 3. Finish: Honed.
 - 4. Size: 1-1/2 by 1/2 inch size by full width of wall or frame opening.
 - 5. Edges: Beveled one side when abutting other floor surfaces, and both sides when abutting other ceramic tile, radius edges from bevel to vertical face.

2.8 TRIMMERS

- A. Provide necessary caps, stops, returns, trimmers and other shapes to complete installation.
- B. Color and finish to match wall tile.

2.9 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
 - 1. Custom Building Products, Seal Beach, CA.
 - 2. Mapei Corporation, Garland, TX.
 - 3. Laticrete International, Inc., Bethany, CT.
 - 4. Bostik, Middleton, MA.
 - 5. Advanced Adhesive Systems, Newington, CT.
- B. Substitutions: Submit in accordance with Section 01600.

2.10 MORTAR MATERIALS - THIN SET BEDS

- A. Dryset and Polymer Additive for Exterior Applications:
 - 1. Description: Two component system; factory prepared second generation high bond strength dryset mortar and liquid polymer additive; complying with ANSI A118.4; full spread.
 - 2. Shear Bond Strength: 500 psi minimum.
 - 3. Acceptable Products:
 - a. Rapidsetting Mortar System by Custom.
 - b. 4237 Latex Thin-Set Mortar with 211 Crete Filler Powder by Laticrete.
 - c. Grani/Rapid by Mapei.
- B. Dryset and Polymer Additive for Interior Applications:
 - 1. Description: Two component system; factory prepared second generation high bond strength dryset mortar and liquid polymer additive; complying with ANSI A118.4.
 - 2. Bond Strength: 400 psi.
 - 3. Acceptable Products:
 - a. Flexbond by Custom.
 - b. 254 Platinum Multipurpose for Floors and Walls by Laticrete.
 - c. Kerabond and Keralastic by Mapei.
- C. Colors: Manufacturers' products shall match Laticrete color selections specified herein.

2.11 EPOXY ADHESIVE

- A. Multi-component, factory prepared, 100 percent epoxy resin and hardener with sand or mineral filler material.
- B. Comply with ANSI A118.3 for thin-set applications for chemical resistant, water cleanable quarry tile installations.
- C. Acceptable Products:
 - 1. 100% Solids Epoxy Mortar by Custom.
 - 2. Latapoxy 300 Epoxy Adhesive by Laticrete.
 - 3. Kerapoxy by Mapei.

2.12 GROUT

- A. Sanded Latex-Modified Grout for Floors:
 - 1. Description: Latex-modified, factory blended, mildew resistant, sanded, grout consisting of Portland cement, graded quartz and additives; comply with ANSI A118.6.
 - 2. Latex Additive: Type as recommended by latex mortar manufacturer.
 - 3. Color: Refer to Drawings.
 - 4. Acceptable Products:
 - a. Polyblend Sanded Grout by Custom.
 - b. 1500 Series Sanded Grout and 1776 Grout Admix Plus by Laticrete.
 - c. Keracolor Floor Grout with Plastijoints by Mapei.
- B. Unsanded Latex-Modified Grout for Wall Tile:
 - 1. Description: Latex-modified, factory blended, mildew resistant, non-sanded, grout consisting of portland cement and additives; comply with ANSI A118.6.
 - 2. Latex Additive: Type as recommended by latex mortar manufacturer.
 - 3. Color: Refer to Finish Schedule on Drawings.
 - 4. Acceptable Products:
 - a. Polyblend Non-Sanded Grout by Custom.
 - b. 1600 Series Unsanded Grout and 1776 Grout Admix Plus by Laticrete.
 - c. Keracolor Wall Grout by Mapei.
- C. Chemical-Resistant Industrial Grade Epoxy Grout: ANSI A118.3, color as indicated.
 - 1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 140 deg F(60 deg C) and 212 deg F(100 deg C), respectively, as certified by mortar manufacturer for intended use.
 - 2. Acceptable Products:
 - a. Spectralock 2000IG by Laticrete
 - b. Kerapoxy IEG by Mapei

2.13 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

- A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.
- B. Polyethylene-Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches (152 mm) wide by a nominal thickness of 0.030 inches (0.76 mm), composed of an inner layer of nonplasticized, chlorinated polyethylene sheet faced on both sides with laminated, high-strength, nonwoven polyester material, designed for embedding in latex-portland cement mortar and as the substrate for latex-portland cement mortar setting bed.
- C. Latex-Rubber Waterproofing: Manufacturer's standard factory-packaged, job-mixed, proprietary, 2-part formulation consisting of liquid-latex rubber and powder for trowel application and glass-fiber-fabric reinforcing.
- D. Acrylic-Latex Waterproofing: Manufacturer's standard proprietary product consisting of one-part acrylic-latex additive and flexible cementitious fiber mortar, factory packaged for job-mixing and trowel application.
- E. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1. Polyethylene-Sheet Waterproofing:
 - a. Nobleseal TS; Noble Company (The).
 - 2. Latex-Rubber Waterproofing:
 - a. Trowel & Seal Waterproof Membrane; Custom Building Products.
 - b. Laticrete 9235 Waterproof Membrane; Laticrete International, Inc.

3. Acrylic-Latex Waterproofing:
 - a. PRP 315; Mapei Corporation.

2.14 CEMENTITIOUS BACKER UNITS

- A. Refer to Section 09250.

2.15 ACCESSORIES

- A. Joint Sealant: Two component polyurethane sealant, ASTM C 920, Type M (self-leveling) for horizontal joints, Type II (non-sag) for vertical joints as specified in Section 07920.
 1. Color: Match grout.
 2. Ensure sealant is chemically compatible with tile, mortar, and grout.
 3. Ensure sealant can physically and chemically withstand environmental conditions normally expected at installation areas.
- B. Joint Backing: Closed cell foam polyethylene.
- C. Prefabricated Sealant Joint:
 1. Prefabricated **stainless steel** joint with two-part, chemically curing non-sag polyurethane sealant.
 2. Size: Height as required by tile by 8-foot lengths.
 3. Color:
 - a. **Stainless Steel: 304, Brushed.**
 - b. Sealant: To match grout.
 4. Acceptable Products:
 - a. CTC Joint by Ceramic Tool Company, Waukesha, WI.
 - b. Surface Expansion Joint, Schluter System Inc., Plattsburgh, NY.
- D. Prefabricated Edge Protection:
 1. **Stainless Steel: 304, Brushed.**
 2. **Acceptable Product: Quadec Model Q-100-EB by Schluter.**
 3. Prefabricated **stainless steel** transition strip with two part, chemically curing non-sag polyurethane sealant joint.
 4. Size: Height as required by tile by 8 foot lengths.
 5. Color:
 - a. **Stainless Steel: 304, Brushed.**
 - b. Sealant: To match grout.
- E. Setting Buttons: Plastic buttons of thickness required for joint size indicated to maintain uniform joint width.

2.16 MIXING MORTAR AND GROUT

- A. Mix mortars and grouts in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that areas to receive tile installed by thin bed method have wood float finish, are true within 1/4 inch in 10'-0", and are pitched to drains where required.
- B. Condition of Surfaces to Receive Tile:
 1. Firm, dry, clean and free of oily or waxy films, mortar and soil.
 2. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work in or behind tile installed.
- C. Air Temperature and Surfaces in Rooms to Receive Flooring: Between 60 degrees to 90 degrees F unless otherwise recommended by manufacturers of materials being installed.

3.2 PREPARATION

- A. Clean substrates.
- B. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of tiles.
- C. Prepare surfaces in strict accordance with instructions of manufacturer whose setting materials or additives are being used.
- D. Acid Based Cleaners: Use not permitted.

- E. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.
- F. Do not seal substrate unless required by manufacturer.
- G. Prime substrate when required by manufacturer.
- H. Elastomeric Membrane:
 - 1. Install membrane in accordance with Section 01600.
 - 2. Flash membrane up adjacent walls and restraining surfaces.
 - 3. Allow membrane to cure as prior to setting tile.
 - 4. Do not allow construction traffic on membrane.
- I. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

- A. Cement Board Substrate: Refer to Section 09250.
- B. Anti-Fracture Membrane
 - 1. Install anti-fracture membrane over cracks of 1/16 inch or greater in substrates. Apply a 12-inch wide strip centered on crack. Install in accordance with manufacturer's recommendations.
- C. Tile Installation, General
 - 1. Install tile materials in accordance with ANSI A137.1, other referenced ANSI and TCNA specifications, and TCNA "Handbook for Ceramic Tile Installation", except for more stringent requirements of manufacturer or these Specifications.
 - 2. Cut and fit tile tight to protrusions and vertical interruptions. Form corners and bases neatly.
 - 3. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joint watertight, without voids, cracks, excess mortar, or grout.
 - 4. Prepare surface, fit, set, bond, grout and clean in accordance with applicable requirements of ANSI standards and Tile Council of America.
 - a. Floors
 - 1) **Thin-set: TCNA F113 (Interior) F102 (Exterior).**
 - 2) Mortar: Latex-portland cement.
 - 3) Grout release.
 - 4) Grout: Latex-portland cement.
 - b. Base:
 - 1) **Thin-Set: TCNA W242/W244.**
 - 2) Mortar: Latex-portland cement.
 - 3) Grout release.
 - 4) Grout: Latex-portland cement.
 - c. Walls
 - 1) Thinset on Gypsum Board: TCNA W242.
 - 2) **Thinset on Cementitious Board: TCNA W244.**
 - 3) Setting: Latex-portland cement.
 - 4) Grout: Latex-portland cement, unsanded.
 - d. Quarry Tile – Floor:
 - 1) Waterproofing membrane under tile and turned up minimum 8 inches onto walls.
 - 2) Thin-set: TCNA F113.
 - 3) Mortar: Latex-portland cement.
 - 4) **Grout: Chemical-Resistant Industrial Grade Epoxy**
 - e. Quarry Tile – Base:
 - 1) Waterproofing membrane under tile and turned up minimum 8 inches onto walls.
 - 2) **Thin-set: TCNA W242/W244.**

- 3) Mortar: Latex-portland cement.
 - 4) **Grout:** Chemical-Resistant Industrial Grade Epoxy
 - f. Exterior Wall
 - 1) **Thin-Set: TCNA W244.**
 - 2) Grout: Latex-portland cement.
- D. Layout
 - 1. Lay out work to pattern indicated so that full tile or joint is centered on each wall and no tile of less than half width need be used. Do not interrupt pattern through openings. Lay out tile to minimize cutting and to avoid tile less than half size.
 - 2. For heights stated in feet and inches, use courses of full tile to produce nearest attainable heights without cutting tile.
 - 3. No staggered joints will be permitted.
 - 4. Align joints in tile in both directions.
 - 5. Align joints between floor and base tile.
 - 6. Make joints between sheets of tile exactly same width as joints within sheet.
 - 7. File edges of cut tile smooth and even.
 - 8. Cut and fit tile at penetrations through tile. Do not damage visible surfaces. Carefully grind edges of tile abutting built-in items. Fit tile at outlets, piping and other penetrations so that plates, collars, or covers overlap tile.
 - 9. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
 - 10. Accurately form intersections and returns.
 - 11. Form internal angles coved and external angles bullnosed.
- E. Thin Set Method, Floors and Walls
 - 1. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with surface to be covered. Maintain 90 percent coverage on back of tile and fully bed corners.
 - a. Exterior: Provide full spread mortar.
 - 2. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
 - 3. When installing large tiles, ceramics or mosaics, trowel small quantity of mortar or adhesive onto back of each tile or sheet of tiles.
 - 4. Set tiles in place and rub or beat with small beating block.
 - 5. Beat or rap tile to ensure proper bond and also to level surface of tile.
 - 6. Align tile to show uniform joints and allow to set until firm.
 - 7. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.
 - 8. Allow face mounted tile to set until firm before removing paper and before grouting.
 - 9. Sound tile after setting. Replace hollow sounding tiles.
- F. Grouting
 - 1. Allow tiles to set a minimum of 48 hours before grouting.
 - 2. Install in accordance with grout manufacturer's recommendations and ANSI A108.10.
 - 3. Pack joints full and free before mortar takes initial set.
 - 4. Clean excess grout from surface with wet cheesecloth as work progresses. Do not use hydro-sponges.
 - 5. Cure after grouting by covering with 4 mil plastic for 12 hours.
 - 6. Install sealant in vertical wall joints at interior corners.
- G. Marble Threshold
 - 1. Provide thresholds at wall or framed openings to other building areas not receiving tile.
 - 2. Set one piece threshold in adhesive without voids, full width of door opening.
 - 3. Point threshold base flush with adjoining tile floors.
 - 4. Cope ends to fit door frame profile.
- H. Control Joints and Other Sealant Usage
 - 1. Install control joints where tile abuts retaining surfaces such as perimeter walls, curbs, columns, wall corners and directly over cold joints and control joints in structural surfaces conforming to architectural details.

2. Install control joint in floors at spacing as indicated in TCNA Installation Handbook, unless noted otherwise.
 3. Rake or cut control joints through setting bed to supporting slab or structure. Keep joints free of mortar.
 4. Install in accordance with TCNA Installation Handbook.
 5. Fill joints with self-leveling polyurethane sealant and backing material specified in Section 07920.
 6. Fill joints around toilet fixtures with white silicone sanitary sealant. Refer to Section 07920.
- I. Expansion Joints:
1. Keep expansion joints free of mortar and grout.
 2. Provide expansion joints directly over changes in material, over control and expansion joints in substrate, at juncture of floors and walls, at other restraining surfaces such as curbs, columns, bases, and wall corners, and where recommended by TCNA EJ171 Expansion Joint requirements.
 3. Install sealant in expansion joints.
 4. Provide sealant material at items penetrating tile work, unless otherwise indicated.
 5. Provide sealants and related materials in accordance with cited ANSI and TCNA requirements.
- 3.4 ADJUSTING
- A. Sound tile after setting. Replace hollow sounding units.
- 3.5 CLEANING
- A. Clean excess mortar from surface with water as work progresses. Perform cleaning while mortar is fresh and before it hardens on surfaces.
 - B. Sponge and wash tile diagonally across joints. Polish with clean dry cloth.
 - C. Remove grout haze following recommendation of mortar additive manufacturer. Do not use acids for cleaning.
- 3.6 PROTECTION
- A. Prohibit traffic from floor finish for 72 hours after installation.
 - B. Where temporary use of new floors is unavoidable, supply large, flat boards or plywood panels for walkways over Kraft paper.
 - C. Protect work so that it will be without any evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 09515

SUSPENDED PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Suspended metal grid ceiling systems and perimeter trim.
 - 2. Acoustical, acrylic, and metal lay-in panels.
 - 3. Non-fire rated.

1.2 SYSTEM DESCRIPTION

- A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture of ceiling suspension system and ceiling panel with 10 years minimum experience.
- B. Installer: Company with 3 years minimum experience.
- C. Certificates
 - 1. Furnish certification of materials and systems conforming to specifications.
 - 2. Submit manufacturer's certification that suspension system is capable of supporting light fixtures and grilles.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01330.
 - 1. Provide product data on metal grid system components, acoustic units.
- B. Submit samples under provisions of Section 01330.
 - 1. Submit 2 samples, 8 by 12 inches in size, illustrating material and finish of each acoustic, gypsum, acrylic, and metal units.
 - 2. Submit 2 samples each, 12 inches long, of suspension system main runner, cross runner, edge trim.
- C. Submit manufacturer's installation instructions under provisions of Section 01330.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store panel cartons open at each end to stabilize moisture content.

1.6 PROJECT CONDITIONS

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Schedule installation of acoustic units after interior wet work is dry.
- C. Humidity: 20 to 40 percent prior to, during, and after installation.
- D. Temperature: 61 degrees F minimum, prior to, during, and after installation.

1.7 EXTRA STOCK

- A. Provide extra quantity of each panel product under provisions of Section 01780.
- B. Provide one unopened and undamaged package of each type.
- C. Store in designated location as directed by Owner.

1.8 COORDINATION

- A. Coordinate installation with other trades and make provisions for their work to prevent cutting and patching.

1.9 GUARANTEE

- A. Guarantee installation of acoustical material to be tight and remain in place for 2 years after final acceptance of the building. Replace any loose or falling materials at Contractor's expense.

PART 2 PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Armstrong World Industries.
 - 2. Chicago Metallic.
 - 3. USG Interiors, Inc.
- B. Substitutions: Under provisions of Section 01600.
- C. Products specified herein are those of USG Interiors as a standard of quality.

2.2 SUSPENSION SYSTEM MATERIALS

- A. Standard Exposed Tee Grid
 - 1. Intermediate duty system, complying with ASTM C 635, non-fire rated.
 - 2. Commercial quality cold-rolled steel, galvanized.
 - 3. Components: Die cut and interlocking.
 - 4. Exposed Grid Surface Width: 15/16 inch.
 - 5. Cope cross runners to lay flush with main runners, except at edge moldings.
 - 6. Finish on Exposed Surfaces: Baked-on enamel, satin finish.
 - 7. Acceptable Products:
 - a. 9/16" Suprafine by Armstrong.
 - b. Prelude Plus XL by Armstrong.
 - c. Donn DX Heavy Duty by USG.
- B. Grid Accessories: Stabilizer bars, furring clips, splices, edge moldings hold down clips and closure strips as necessary to complete and complement suspended ceiling grid system.
 - 1. Components: Die-cut and interlocking.
- C. Support Channels and Hangers: Galvanized steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

2.3 MANUFACTURERS - ACOUSTIC UNITS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Armstrong World Industries.
 - a. Contact: Hedda Metzler, 1-877-276-7876, ext 5217.
 - 2. Celotex Corp.
 - a. Contact: Brian Fitzgerald, 1-800-235-6839.
 - 3. USG Interiors, Inc.
- B. Substitutions: Under provisions of Section 01600.

2.4 ACOUSTIC UNIT MATERIALS

- A. Type 1 Lay-in Panel (C-1): Conforming to the following:
 - 1. Size: 24 by 48 inches.
 - 2. Thickness: 1/2 inches.
 - 3. Composition: Non-combustible exterior gypsum.
 - 4. Pattern: Stipple, vinyl faced, white color.
 - 5. Acceptable Products:

- a. Refer to Finish Schedule on drawings.
- B. Type 2 Metal Lay-in Panel (C-2): Conforming to the following:
 - 1. Size: 24 by 24 inches.
 - 2. Composition: Metalworks Tin.
 - 3. Surface: Lacquered Steel Finish.
 - 4. Acceptable Product:
 - a. Refer to Finish Schedule on drawings.
 - 5. Grid: 15/16", Lacquered Steel Finish.

2.5 ACCESSORIES

- A. Hanger Wire: Minimum 12 gage, galvanized, self-annealed, mild steel wire.
- B. Rigid Compression Struts: As indicated on Drawings.
- C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION – LAY-IN GRID SUSPENSION SYSTEM

- A. Install system in accordance with ASTM C 636, manufacturer's instructions and as supplemented in this Section, to produce a ceiling true to lines and levels, free from warp and soiled or damaged grid or panels.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang system independent of walls, columns, ducts, pipes and conduit. Hang wires directly from structure, not from fireproofing, fireproofing suspension members, bridging or roof decks. Locate first hanger 6 inches from wall and space 48 inches along carrying channel. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Center system on room axis leaving equal border units, unless shown otherwise on the drawings. Do not leave panels less than 1/2 length or width.
- G. Do not support fixtures or other components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- H. Do not eccentrically load system, or produce rotation of runners.
- I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Field rabbett panel edges. Where round obstructions occur, provide preformed closers to match edge molding. Provide prefabricated radius edge moldings around radius wall corners. Use maximum lengths, straight, true to line, and level.
- J. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- K. Lateral Bracing: Provide four 12 gage wires at 90 degrees as indicated on Drawings; minimum 12 feet on center.

3.3 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

- C. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border neatly against abutting surfaces.
- D. Install units after above ceiling work is complete.
- E. Install acoustic units level, in uniform plane, and free from twist, warp and dents.
- F. Cut panels to fit irregular grid and perimeter edge trim. [Field rabbet panel edge.]
- G. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

3.4 TOLERANCES

- A. Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Variation from Plumb of Grid Members Caused by Eccentric Loads: Two degrees maximum.

3.5 ADJUSTING AND PATCHING

- A. Replace damaged members of exposed suspension system. Replace ceiling board and panel that is damaged, installed improperly, or shows visible signs of sagging.

3.6 CLEANING

- A. Clean soiled areas of ceiling material with mild soap and water. Replace ceiling board and panel damaged by improper cleaning.

END OF SECTION

SECTION 09775

FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes:
 - 1. Fiberglass reinforced wall paneling.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with Section 01600.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with minimum three years experience specializing in manufacturer of glass reinforced panels.
- B. Installer: Approved by manufacturer and having successfully completed five projects of similar scope and complexity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Kemlite Company, P.O. Box 2429, Joliet, IL.
 - a. Contact: 800-435-0080.
 - 2. Marlite, 1360 Bent Trail Circle, Southlake, TX.
 - a. Contact: William J. McAuley, 817-481-4554.
- B. Substitutions: Submit in accordance with Section 01600.

2.2 PRODUCTS

- A. Fire Resistance Rating per ASTM E-84:
 - 1. Flame Spread: Class C.
 - 2. Smoke Developed: 450.
- B. Physical characteristics:
 - 1. Flexural strength: 15,000 psi.
 - 2. Tensile strength: 9,000 psi.
- C. U.S.D.A. approved.
- D. Thickness: 1/8 inch, minimum, weighing 1-1/2 lbs/sq.ft.
- E. Texture: Pebble.
- F. Colors:
 - 1. White: Unless noted otherwise.
 - 2. Black: As noted on the drawings.
- G. Acceptable Products:
 - 1. Glasbord P by Kemlite.
 - 2. Sanitary Wall Systems by Marlite.

2.3 ACCESSORIES

- A. Adhesive: Water and mildew resistant of type recommended by panel manufacturer.
- B. Primer-Sealer: As recommended by panel manufacturer.
- C. Accessories: Batten strips and related items as required and as recommended by manufacturer.

- D. Molding: Standard vinyl moldings of color to match panel including division bars, inside corners, outside corners, caps, and base.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to receive work of this Section.
- B. Notify Construction Manager of any existing conditions that will adversely affect execution.
- C. Beginning of execution will constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Prepare substrate surfaces as recommended by manufacturer.

3.3 INSTALLATION

- A. Install using skilled workmen in accordance with manufacturer's printed instructions and recommendations.

3.4 ADJUSTING

- A. Fasten or adhere for tight connections and joints.

3.5 CLEANING

- A. Perform final cleaning in accordance with Section 01740.

END OF SECTION

SECTION 09910

PAINTS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Complete interior and exterior surface preparation and finishing for field application of latex based coatings, and requirements for field finishing mechanical and electrical equipment.
 - 2. Examine specifications for various other trades and their provisions regarding their painting. Surfaces that are left unfinished by other sections of specifications, shall be painted or finished as a part of this Section.
 - 3. Colors, including deep tones are scheduled on Drawings.

1.2 SURFACES NOT TO RECEIVE FIELD FINISHING

- A. Do not paint copper, bronze, chrome plated items, nickel, stainless steel, Monel metal, lead, face brick, prefinished wall, ceiling, and floor coverings, items with factory applied final finish (except where exposed on roofs and in finished spaces), chases, and plenums above suspended ceilings unless otherwise specified or scheduled.

1.3 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this Section.

1.4 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with 3 years experience.
- B. Applicator: Company specializing in commercial painting and finishing with 3 years experience.
- C. Product Labels: Include manufacturer's name, type of paint, stock number, color, and label analysis on label of containers.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable building code for flame spread/fuel contribution/smoke development rating requirements for finishes.
- B. Comply with applicable city, county, state, and federal requirements and ordinances regarding maximum VOC (Volatile Organic Compound) content of coatings.

1.6 TESTS

- A. Provide periodic testing with Wet Film Thickness gage to verify that proper thickness of finish coatings are being applied.

1.7 SUBMITTALS

- A. Submit product data under provisions of Section 01330.
 - 1. Provide product data describing physical performance criteria and composition on finishing products.
- B. Submit color selection samples under provisions of Section 01330.
- C. Submit 2 samples, 12 by 12 inches in size illustrating range of colors and textures scheduled for each surface finishing product scheduled.
- D. Submit manufacturer's application instructions under provisions of Section 01330.

- E. Submit certification from manufacturer of coatings listing products proposed for each. Certify that each product meets current applicable regulations and ordinances regarding maximum VOC content.
- 1.8 FIELD SAMPLES
- A. Provide field samples under provisions of Section 01450.
 - B. Provide field sample panel, 96 inches long by 96 inches wide, illustrating each coating color, texture, and finish intended for use.
 - C. Locate where directed.
 - D. Accepted sample may remain as part of the Work.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to site under provisions of Section 01600.
 - B. Store and protect products under provisions of Section 01600.
 - C. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
 - D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
 - E. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.
 - F. Take precautionary measures to prevent fire hazards and spontaneous combustion.
- 1.10 ENVIRONMENTAL REQUIREMENTS
- A. Do not apply materials when surface and ambient temperatures are outside the ranges required by paint manufacturer.
 - B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
 - C. Do not apply exterior coatings during rain or snow, or when relative humidity is above 75 percent, unless required otherwise by manufacturer's instructions.
 - D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
 - E. Minimum Application Temperature for Varnish and Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
 - F. Provide lighting level of 80 foot candles measured mid-height at substrate surface.
- 1.11 EXTRA STOCK
- A. Provide a 5-gallon container of each color to Owner.
 - B. Label each container with color, color number, texture, and room locations, in addition to the manufacturer's label.
 - C. Furnish under provisions of Section 01780.
- 1.12 SCAFFOLDS AND PROTECTION
- A. Provide adequate safe ladders, scaffolds, and stages necessary to complete work.
 - B. Protect completed finish and paint work, and protect adjacent finish surfaces from paint splatter, spills and stains. Use adequate drop cloths and masking procedures during progress of work.
- 1.13 PRECAUTIONS
- A. Do not store paints, oils, thinners and other flammable items inside the building. Store in approved containers when not in actual use during painting. Keep fire hazard at a minimum.
 - B. Take precaution to protect public and construction workers during progress of work.
 - C. Furnish a temporary fire extinguisher of suitable chemicals and capacity, located near flammable materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. The Sherwin-Williams Company, Cleveland, OH.
 - a. Contact: Brett Huckelbury, 214-728-6696 or bchuckelbury@sherwin.com.
 - 2. Pittsburgh Paints, PPG Industries, Inc., Pittsburgh, PA.
 - a. Contact: Steven Frank, 888- 774-4332 or steven.frank@gliddenprofessional.com.
 - 3. Pratt & Lambert, Inc., Chicago, IL.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Acceptable Products: Refer to schedule at end of section.
- C. Materials selected for coating systems for each type surface shall be product of a single manufacturer unless otherwise specified and approved by manufacturers of products used.
- D. Secondary Products such as Linseed Oil, Turpentine and Shellacs: First quality products of a reputable manufacturer.
- E. Products specified in the Schedule are provided as a standard of quality unless noted otherwise.
- F. Substitutions: Submit in accordance with Section 01600.
- G. Fire Resistant Coatings
 - 1. Flame Control Coatings, Inc., P.O. Box 786, Hyde Park Blvd., Niagara, New York 14302, (716) 282-1399:
 - a. Hi-Gloss Fire Resistant Enamel.
 - b. Universal Metal Primer, Lead Free.
 - c. #129 Fire Retardant Varnish.
 - d. #130 Semi-Gloss Fire Retardant Varnish.

2.2 MATERIALS

- A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating with good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- C. Patching Materials: Latex filler.

2.3 FINISHES

- A. Refer to schedule at end of Section.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report to Construction Manager any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Interior Located Wood: 15 percent, measured in accordance with ASTM D 2016.
 - 3. Exterior Located Wood: 15 percent, measured in accordance with ASTM D 2016.
 - 4. Concrete Floors: 8 percent.
- D. Test shop applied primers for compatibility with subsequent cover materials.
- E. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
- B. Correct minor defects and clean surfaces that affect work of this Section.
- C. Shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- G. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.
- H. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Concrete Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- J. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- K. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- L. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- M. Interior Wood Items Schedule to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- N. Exterior Wood Scheduled to receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.
- O. Shop Finished Items: Finish in accordance with AWI standards and guide lines.
- P. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.4 APPLICATION

- A. Interior paint colors to be approved by Owner prior to applications.
- B. The intent of these Specifications is to produce the highest quality appearance of paint and finish surfaces. Employ skilled mechanics only. The proper preparation of all surfaces will be strictly enforced and wherever finished surfaces show any defects due to improper preparation, workmanship, etc., the defects shall be removed and the work refinished at the expense of the Contractor.

- C. Apply products in accordance with manufacturer's instructions. Final finish coats shall have visual evidence of solid hiding and uniform appearance, and shall be free and smooth of brush marks, streaks, sags, runs, laps, or skipped areas.
- D. Do not apply finishes to surfaces that are not dry.
- E. Apply each coat to uniform finish and thickness.
- F. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- G. Sand lightly between coats on wood and metal items to achieve required finish.
- H. Allow applied coat to dry before next coat is applied.
- I. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Prime back surfaces of interior and exterior woodwork scheduled to be painted with primer paint.
- K. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- L. Edges of paint adjoining other materials or colors shall be sharp and clean with no overlapping.

3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint shop primed equipment. Paint shop prefinished items where exposed to view in finished spaces. In mechanical rooms, repair shop pre-finished coatings that have been scratched or otherwise damaged with identical touch-up paint. Sand prior to touching up as required.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Paint grilles, registers, diffusers, and speaker grilles to match adjacent wall and ceiling surfaces, except that factory pre-finished items need not be painted if installed in a suspended acoustical ceiling system where the acoustical panels match the mechanical or electrical item color.
- D. In finished spaces, prime and paint exposed pipes, conduit, boxes, ducts, hangers, brackets, collars and supports. Paint to match adjacent surfaces.
- E. Repair or replace identification markings on mechanical or electrical equipment when painted accidentally.
- F. Paint interior surfaces of air ducts and convectors that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector to match face panels.
- G. Paint surfaces of plywood backboards for electrical and telephone equipment before installing equipment.
- H. Color Coding: Coding and flow indications may be done with stencils and black paint. Stencil on exposed piping in mechanical rooms at 10 feet on center maximum. Stencil piping above accessible ceilings and in crawl spaces at 20 feet on center maximum. Make letters readable from a normal position standing on the floor. Refer to Section 15075.
- I. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.
- J. Paint exposed air handlers, roof ventilators, goose necks, exhaust fans and other items on the roof with 2 coats exterior enamel. Prepare surfaces in accordance with the base metal or primer as specified herein.
- K. Paint concrete support bases with gray floor deck enamel.
- L. Pipe hangers and other supports need not be painted except where installed in crawl spaces, where they shall be painted with a thick coat of asphaltic paint.

3.6 CLEANING AND TOUCH-UP

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

- D. Spot painting will be allowed to correct soiled or damaged paint surfaces only when touch-up spot will blend into surrounding finish and is invisible to normal viewing as determined by the Construction Manager. Otherwise, re-coat entire section to corners or visible stopping point.

3.7 VOC (VOLATILE ORGANIC COMPOUND) COMPLIANCE

- A. Products listed in following schedule and substitutes proposed for use must be formulated to meet applicable ordinances and regulations regarding maximum VOC content. Utilize products which have been specially formulated to need such requirements.

3.8 INTERIOR COATING SCHEDULE

- A. Painted Wood Shelves and Their Related Supports:
 - 1. Sherwin-Williams
 - a. One coat of Premium Wall & Wood Interior Latex Primer, B28W8111.
 - b. Two coats of Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
 - 2. PPG
 - a. One coat of Seal Grip Universal Alkyd Primer 17-941NF.
 - b. Two coats of Gloss Alkyd Enamel 6-282.
- B. Gypsum Drywall Ceilings:
 - 1. Sherwin-Williams
 - a. One coat of ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - b. Two coats of ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.
 - 2. PPG
 - a. One coat of Interior Primer/Sealer 6-2.
 - b. Two coats Speedhide Latex Flat 6-70.
- C. Gypsum Drywall:
 - 1. Sherwin-Williams
 - a. One coat of ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - b. Two coats of ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series. Eg-Shel, B20-2600 Series, Semi -Gloss, B31-2600 Series – Refer to drawings for sheen locations.
 - 2. PPG
 - a. One coat of Interior Primer/Sealer 6-2.
 - b. Two coats Speedhide Latex Flat, 6-45, Eggshell, 6-411, Semi-Gloss, 6-500 – Refer to drawings for sheen locations.
- D. Wood Doors to be Stained:
 - 1. Sherwin-Williams
 - a. One coat Wood Classics Interior Oil Stain, A49-200 Series.
 - 1) Brush apply stain and wipe with soft cotton rags to match sample approved by the Owner.
 - 2) Pre-stain T&G joints prior to applying boards and trim.
 - b. Colored Wood filler and sand.
 - c. One coat each, Flame Control Coatings fire retardant varnishes:
 - d. One coat of #129 Fire Retardant Varnish:
 - 1) Application Rate: 300 sq. ft./gal.
 - 2) Brush applied.
 - e. One coat of #130 Fire Retardant Varnish, Semi-Gloss:
 - 1) Application Rate: 600 sq. ft./gal.
 - 2) Brush applied.
 - f. Substitutions for the fire retardant finish manufacturer will not be accepted.
- E. Wood Trims, T&G Wall cladding, Shelves and other Related Wood to be Stained:
 - 1. Sherwin-Williams
 - a. One coat Wood Classics Interior Oil Stain, A49-200 Series.
 - 1) Brush apply stain and wipe with soft cotton rags to match sample approved by the Owner.
 - 2) Pre-stain T&G joints prior to applying boards and trim.

- b. Colored Wood filler and sand.
 - c. One coat each, Flame Control Coatings fire retardant varnishes:
 - d. One coat of #129 Fire Retardant Varnish:
 - 1) Application Rate: 300 sq. ft./gal.
 - 2) Brush applied.
 - e. One coat of #130 Fire Retardant Varnish, Semi-Gloss:
 - 1) Application Rate: 600 sq. ft./gal.
 - 2) Brush applied.
 - f. Substitutions for the fire retardant finish manufacturer will not be accepted.
- F. Baseboards:
- 1. Sherwin-Williams
 - a. Two coats Wood Classics Polyurethane Varnish, A67 Series.
 - 2. PPG
 - a. Two coats of Olympic Interior Gloss Polyurethane Varnish 43884.
 - 3. Brush Applied.
- G. Millwork POS cabinets:
- 1. Pre-finished by Owner's "Owner Provided" millwork supplier.
 - 2. Final coat applied in field by General Contractor.
 - a. One coat of #130 Fire Retardant Varnish, Semi-Gloss:
 - 1) Application Rate: 600 sq. ft./gal.
 - 2) Brush applied.
 - 3.
- H. Hollow metal doors and frames of the building, louvers, and exposed gas piping including exterior:
- 1. Sherwin-Williams
 - a. One coat of Pro-Cryl Universal Water Based Metal Primer, B66-310 Series.
 - b. Two coats of Pro Industrial Acrylic Gloss, B66-600 Series.
 - 2. PPG
 - a. One coat of Pitt Tech DTM Acrylic Primer/Finish 90-712.
 - b. Two coats Pitt Tech DTM Acrylic Gloss 90-374.
- I. Iron railings, shelf brackets, shelf supports, metal legs of wood benches and other related metal to be painted:
- 1. Sherwin-Williams
 - a. One coat of Pro-Cryl Universal Water Based Metal Primer, B66-310 Series.
 - b. Two coats of Pro Industrial Acrylic Gloss, B66-600 Series.
 - 2. PPG
 - a. One coat of Pitt Tech DTM Acrylic Primer/Finish 90-712.
 - b. Two coats Pitt Tech DTM Acrylic Gloss 90-374.
- J. Metal trims for grilles, diffusers and other related metal items directly in contact with the ceiling panels:
- 1. Sherwin-Williams
 - a. One coat of Pro-Cryl Universal Water Based Metal Primer, B66-310 Series.
 - 2. PPG
 - a. One coat of Pitt Tech DTM Acrylic Primer/Finish 90-712.
 - 3. Finish: Match adjacent surfaces or as directed by Owner.
- K. Interior metal plenums and ductwork directly behind grilles and diffusers:
- 1. Sherwin-Williams:
 - a. One coat ProMar 400 Zero VOC Flat Black Latex, B30B4600.
 - 2. PPG
 - a. One coat Speedhide Int/Ext Flat Black Latex 6-753.
 - 3. Color: Black.
 - 4. Spray applied.
 - 5. The purpose of this coating is to completely cover the reflection of light in grilles and diffusers.
- L. Steel Liquor Gantry:

1. Pre-finished by Owner's "Owner Provided" millwork supplier.
- M. Miscellaneous Items Exposed to View and Not Otherwise Scheduled: Finish with Tnemec Paint No. 48GR – Moonshadow.

3.9 EXTERIOR COATING SCHEDULE

- A. Exterior Wood not noted otherwise.
 1. Pre-Prime:
 - a. Areas to receive one coat primer tinted to match finish color.
 - 1) Permalize for pine.
 - 2) Vapex for cedar.
 - b. Pre-prime butt or tongue and groove joints prior to applying to members.
 2. Sherwin-Williams
 - a. One coat Exterior Oil-Based Wood Primer, Y24W8020.
 - b. Two coats A-100 Exterior Latex Satin, A82-100 Series.
 3. PPG
 - a. One coat Seal Grip Universal Alkyd Primer 17-941NF
 - b. Two coats Speedhide Exterior Satin Latex, 6-2045XI
- B. Dryvit / Stucco / Eifs:
 1. Sherwin-Williams
 - a. One coat of Loxon Concrete & Masonry Primer, A24W8300.
 - b. Two coats of ConFlex XL Smooth Elastomeric, A5-400 Series.
 2. PPG
 - a. One coat Perma-Crete Alkali-Resistant Primer 4-603
 - b. Two coats of Speedhide Exterior Satin Latex, 6-2045XI
- C. Hollow metal doors and frames, louvers and exposed gas piping:
 1. Sherwin-Williams
 - a. One coat of Pro-Cryl Universal Water Based Metal Primer, B66-310 Series.
 - b. Two coats of Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
 2. PPG
 - a. One coat Pitt Tech DTM Acrylic Primer/Finish 90-712
 - b. Two coats Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210
- D. Metal flashing, metal bollards, ladders, angle door stops, fence pipe posts, pipe railings and other related metal surfaces to be painted, unless noted otherwise:
 1. Sherwin-Williams
 - a. One coat of Pro-Cryl Universal Water Based Metal Primer, B66-310 Series.
 - b. Two coats of Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
 2. PPG
 - a. One coat of Pitt Tech DTM Acrylic Primer/Finish 90-712.
 - b. Two Finish Coats : Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210.
- E. Shop Finishes: Refer to individual sections.
- F. Wood Trellis, Wood Entry and Side Canopies, All other exterior decorative cedar not noted elsewhere:
 1. Sherwin-Williams
 - a. Two coats of Woodscapes Exterior Polyurethane Semi-Transparent Stain, A15T00005.
 2. Ready Seal
 - a. Two coats of Ready Seal Semi-transparent, Oil based wood stain.
- G. Steel Brackets for Wood Trellis, Wood Entry and Side Canopies:
 1. Sherwin-Williams
 - a. One coat factory applied primer.
 - b. Two coats of Pro Industrial Acrylic Eg-Shel, B66-660 Series.
 2. PPG
 - a. One coat factory applied primer.

- b. Two Finish Coats : Pitt Tech Plus DTM Acrylic Satin 90-1110.

3.10 COLOR AND LOCATION SCHEDULE

- A. Refer to Finish Schedule on drawings.

END OF SECTION

SECTION 10135

STAINLESS STEEL TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Stainless steel compartment work includes the following:
 - 1. Floor anchored/overhead-braced partitions.
- B. Furnish all labor and materials necessary for the completion of work in this section as shown on the contract drawings and specified herein.
- C. Work in this section shall include but is not limited to:
 - 1. Toilet compartments
 - 2. Hardware for toilet compartments
 - 3. Shop drawings and working drawings
 - 4. Manufacturer's guarantee
- D. Related work specified elsewhere shall include accessories and anchorage/blocking for attachment of compartments.

1.2 SUBMITTALS

- A. Shop drawings and details.
- B. Samples:
 - 1. Submit (4) samples of #4 satin finish stainless steel illustrating color and finish for each product and hardware.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Provide products for entire system from one manufacturer, unless otherwise acceptable to Construction Manager.
 - 2. Provide products from a single manufacturer to ensure material compatibility where different materials come in direct contact with each other.
 - 3. Provide as complete unit, including accessory items necessary for proper function.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum 10 years documented experience.
- C. Regulatory Requirements: Conform to Americans with Disabilities Accessibility Guidelines (ADAAG), ANSI A117.1, or local or state codes for provisions for the physically handicapped, whichever is more stringent.

1.4 PRE-INSTALLATION CONFERENCE

- A. Conduct pre-installation conference in accordance with Section 01310.
- B. Convene pre-installation conference prior to closing walls to coordinate necessary blocking and 2 weeks prior to installation.
- D. 2 week prior Conference Purpose and Agenda:
 - 1. Visit Project site to analyze site conditions, and inspect surfaces in order that recommendations may be made should adverse conditions exist.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements are as shown on shop drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials in accordance with requirements of Section 01600.
- B. Store materials in weather tight location.
- C. Keep materials in original wrappers until installation is complete

1.7 WARRANTY

- A. Provide Warranties under provisions of Section 01780.
- B. Manufacturer's Warranty:
 - 1. Manufacturer guarantees its stainless steel units, properly maintained, against corrosion or discoloration for 5 years from the date of Substantial Completion.
 - 2. If materials are found defective during that period for the reasons listed above, the material will be replaced free of charge.
- C. Subcontractor's Warranty:
 - 1. Subcontractor shall covering defects in workmanship for a period of 5 Years from Date of Substantial Completion for this Project.
 - 2. Should any defect develop during the warranty period due to improper, subcontractor shall repair or replace defective work at no cost to the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
 - 1. Global Partitions, Eastanollee, GA 30538.
- B. Acceptable Product Floor Anchored/Overhead Braced by Global.
- C. Substitutions: In accordance with the requirements of Section 01600.

2.2 MATERIALS

- A. Stainless Steel:
 - 1. 22-gauge, stretcher-leveled quality stainless steel formed and bonded under pressure with a non-toxic adhesive
- B. Core: Resin-impregnated, sound-deadening full-face honeycomb.
- C. Stainless Steel: ASTM A 167, type 302/304, satin lustre finish.
- D. Chrome Plating: ASTM B 456.
- E. Mounting Brackets: Manufacturer's standard satin lustre stainless steel or anodized polished aluminum.
- F. Hardware
 - 1. Hinge: Stainless steel or chrome plated brass, spring action cam adjustable to hold open at angle up to 90 degrees and wrap around flanges. Upper and lower door hinges are recessed.
 - 2. Latch: Manufacturer's standard stainless steel or chrome plated brass thumb turn or slide bolt with emergency operation, chromium plated vandal resistant fasteners.
 - a. Provide slide bolt in accessible stall.
 - 3. Door Strike and Keeper: Manufacturer's standard stainless or chrome plated steel combination type with rubber face.
 - 4. Coat Hook: Manufacturer's standard stainless steel or chrome plated brass combination hook and rubber tipped pin.
 - 5. Door Pull: Manufacturer's standard stainless steel or chrome plated brass, for out swinging doors.
- G. Anchorage and Fasteners
 - 1. Exposed Fasteners: Manufacturer's standard stainless steel or chrome plated brass with theft-resistant type screw head and nuts.
 - 2. Concealed Fasteners: Hot-dip galvanized or cadmium plated.

2.3 FABRICATION

- A. Provide compartments of floor anchored and overhead braced style
- B. Provide screens of floor anchored style.
- C. Take field measurements to ensure proper fitting of Work. Shop assemble to greatest extent possible.
- D. Partitions, Pilasters, Screens, and Doors:

1. Doors, Screens, Pilasters and Partition perimeters shall be sealed with a 22-gauge stainless steel interlocking molding. Molding corners shall be welded to each other and to face sheets and ground smooth to form a rigid frame around the component.
 2. Conceal reinforcement for installation of hardware and fittings.
 3. Notch recesses and finish holes and cut outs for hardware, fittings, grab bars and accessories.
- E. Dimensions:
1. Doors: 1 inch thick minimum units; 24 inch wide inward swing doors and 36 inch wide outward swinging doors for accessible stall.
 2. Pilasters: Manufacturer's standard 1-1/4 inch thick.
 3. Panels: Manufacturer's standard 1 inch thick
 4. Urinal Screens: 1 inch thick, 18 inches wide and 42 inches tall unless noted or shown otherwise.
- F. Supports and Hangers: Inverted stirrup with a jack bolt for leveling during installation and permanent height adjustment shall be welded within the base of each pilaster. "L" brackets shall be coupled to the stirrup bracket and floor for full range adjustment.
- G. Pilaster Shoes: Shoe shall be formed of type 304 stainless steel 3" high with a #4 satin finish, each mounting shall be concealed and have an internal cross section conforming to the pilaster.
- H. Wall Brackets: Panel brackets, two ear, "T" style.
- I. Panel to Pilaster Brackets: Stirrup brackets shall be 2 1/8" long chromium plated die cast zamac. Stirrup brackets shall be 1/8" thick and mounted with chrome plated steel vandal resistant fasteners. The attachment of brackets to the adjacent wall construction shall be accomplished with 2 1/2" chrome plated steel vandal resistant screws and plastic anchors.
- J. Headrail:
1. Made of heavy-duty anodized extruded aluminum (6063-T5 alloy).
 2. Anti-grip and attached to the top of the pilaster with stainless steel vandal resistant screws.
 3. Provide bridge to all compartments and brace the end freestanding pilasters to the wall.
 4. Brackets shall be made from a die cast aluminum alloy and shall be attached to the adjacent wall construction with 2 1/2" stainless steel vandal resistant screws and plastic anchors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive toilet compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect installation of compartments. Report any discrepancies to the architect.
- B. Take complete and accurate measurements of toilet compartment locations.
- C. Start of work constitutes acceptance of job.

3.2 PREPARATION

- A. Prepare and clean surfaces in accordance with manufacturer's instructions.
- B. Remove loose materials and matter that might impair smooth, level and plumb installation.
- C. Protect elements adjoining and surrounding work of this Section from damage and disfiguration.

3.3 ERECTION

- A. General
 1. Install partitions and screens rigid, straight, plumb and level.
 2. Maintain clearances of not more than 1/2 inch between pilasters and panels.
 3. Maintain clearances of not more than 1 inch between panels and walls.

4. Secure panels to walls with not less than two stirrups brackets, attached near top and bottom of panel.
 5. Locate wall brackets so that holes for wall anchorages occur in tile joints.
 6. Conceal evidence of drilling, cutting and fitting to room finish.
- B. Floor Mounted Overhead Braced Partitions and Screens
1. Attached pilasters to supporting floor with pilaster supports.
 2. Level, plumb, and tighten installation with leveling device.
 3. Secure pilaster shoes in position.
 4. Secure headrail to pilaster face with not less than two fasteners preface. Secure headrail to walls.
 5. Set tops of doors parallel with overhead brace when doors are in closed position.
- C. Wall-Mounted Panels and Screens
1. Attach to wall with anchoring devices and wall brackets.
 2. Position, level and tighten units.
- 3.4 ERECTION TOLERANCES
- A. Maximum Variation From Plumb or Level: 1/8 inch.
 - B. Maximum Misplacement From Intended Position: 1/8 inch.
- 3.5 ADJUSTING
- A. Adjust and lubricate hardware for proper operation after installation.
 - B. Set hinges on inward swing doors to hold doors open approximately 30 degrees from closed position when unlatched.
 - C. Set hinges on outward swing doors to return to fully closed position.
 - D. Perform final adjustments to leveling devices and hardware.
 - E. Adjust and align hardware for uniform clearance at vertical edges of doors not exceeding 3/16 inch.
- 3.6 CLEANING
- A. Clean work under provisions of Section 01740.
 - B. Remove protective coverings.
 - C. Clean surfaces free of oil, dirt and imperfections.
- 3.7 PROTECTION OF FINISHED WORK
- A. Protect finished installation under provisions of Section 01500.
 - B. Field touch-up of finished surfaces will not be permitted. Replace damaged components.

END OF SECTION

SECTION 10265

CORNER GUARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Corner Guards

1.2 PERFORMANCE REQUIREMENTS

- A. Performance Requirements
 - 1. Meet ASTM E 84 characteristics as follows
 - a. Flame Spread: 25 Maximum.
 - b. Smoke Developed: 450 Maximum.
 - 2. When used as part of a fire rated assembly, devices must be capable of maintaining the specified or indicated hourly rating when tested in accordance with ASTM E 119.
- B. Installed component assembly to support vertical live load of 100 pounds per lineal foot with deflection not to exceed 1/50 of span between supports.
- C. Corner guards to resist lateral impact force of 100 pounds at any point without permanent damage.

1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Product Data: Submit manufacturer's descriptive technical data including test performance data and performance characteristics for each product proposed for use.
- C. Samples: Submit actual samples of scheduled colors and finishes.
- D. Certificates: Submit certificates indicating product's compliance with referenced standards and tests.
- E. Manufacturer's Instructions: Submit manufacturer's recommended installation instructions and suggested fastener types/patterns for each substrate encountered.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture and fabrication of wall protection devices with five years experience.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Shop Drawings.

1.6 COORDINATION

- A. Coordinate work under provisions of Section 01310.
- B. Coordinate the work with wall or partition Sections for installation of concealed blocking or anchor devices.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with Section 01600

1.8 SEQUENCING AND SCHEDULING

- A. Begin work only after substrate work is complete and attachment devices in hollow walls is verified as being accurately placed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Balco Inc., Wichita, Kansas
 - 2. Construction Specialties Inc., Muncy, PA
 - 3. Pawling Corp., Wassaic, NY
 - 4. Tubular Specialties Manufacturing Inc., Los Angeles, CA.
 - 5. Tri-Guards Inc., Wheeling, IL
- B. Substitutions: Submit under provisions of Section 01600.
- C. Note: Not all products of each manufacturer above are acceptable for use. Refer to "acceptable products" listings herein for standards of quality to be met for each type device.

2.2 CORNER GUARDS

- A. Surface Metal - without Retainer
 - 1. Design: Surface applied with surface fasteners [with adhesive].
 - 2. Material: Stainless Steel with 2 inch wide flanges.
 - 3. Thickness: 16 gage.
 - 4. Finish: No. 4 Satin.
 - 5. Acceptable Product: Model CG-50 (90 degrees) and CG-60 (135 degrees) Pro-Tek by Pawling Corp. Use custom product on other than 90 and 135 degree corners.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.
- B. Verify that substrate finishes are complete and attachment devices in hollow walls are accurately located.

3.2 INSTALLATION

- A. Install using skilled workmen in accordance with manufacturer's printed instructions.
- B. Located devices as shown on the Drawings.
- C. Stop corner guards at heights indicated. If no heights are indicated, carry device to [48 inch above finish floor] [ceiling line].
- D. Use attachment devices as recommended by manufacturer on adhesive applied devices.

3.3 ADJUSTING

- A. On flush mounted devices, verify that device is flush with adjacent wall surface. Adjust as required for proper fit and appearance.

3.4 CLEANING

- A. Remove protective coverings on devices only at final cleaning stage.

END OF SECTION

SECTION 10400

SIGNS

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. Interior panel signs for toilet room identification.
 - 2. Exterior parking signs for handicapped accessible identification.
 - 3. Installation of Owner furnished signs for "To Go" parking.
 - 4. Signage accessories.
 - 5. Coordination of Owner furnished and installed exterior signage. Refer to Drawings.
 - 6. Coordination of Owner furnished and installed interior signage. Refer to Drawings.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout.
- C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Approved samples will be returned for installation into Project.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
 - 1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Illuminated Exit Signs: Refer to Division 16.
 - b. Signs for Accessible Spaces: ADA.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
 - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
- B. Cast-Acrylic Sheet: Manufacturer's standard and as follows:
 - 1. Color: Refer to Finish Legend.
- C. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
 - 1. Edge Condition: Refer to Drawings.
 - 2. Corner Condition: Refer to Drawings.
- D. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- E. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 - 1. Panel Material: Opaque acrylic sheet.
 - 2. Raised-Copy Thickness: Not less than 1/32 inch.
- F. Colored Coatings for Acrylic Sheet: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

2.2 ACCESSORIES

- A. Mounting Methods: Use silicone adhesive fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 HANDICAPPED PARKING AND "TO GO" SIGNS

- A. Screen Printed Signs:
 - 1. 18 gage bonderized steel with blue baked enamel finish and white screen printed copy.
 - 2. Copy and Size (unless noted otherwise):
 - a. "Handicapped Parking Only" - 12 inches by 18 inches.
 - b. "Van Accessible" - 12 inches by 6 inches.
 - c. "TO GO" Signs: Sign furnished by Owner.
 - d. Refer to drawings for other sign dimensions and requirements
 - 3. Acceptable Product: Best Traffic Signs No. SS04 with SS52 as required.
- B. Post: 2 inch diameter galvanized pipe column minimum 9 feet long.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
 - 2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.3 EXTERIOR INSTALLATION – HANDICAPPED PARKING AND “TO GO” SIGNS

- A. Mount posts in 12 inch round by 2'-6" deep concrete footing.
- B. Signs Mounting Height: Refer to drawings.

3.4 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10400

SECTION 10525

FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Fire extinguishers.
 - 2. Mounting hardware.

1.2 DEFINITIONS

- A. Where indicated on the Drawings the abbreviation "FE" is for fire extinguisher without cabinet.

1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Product Data: Include physical dimensions, operational features, color and finish, anchorage details, material descriptions and type of hardware.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01780.
- B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products in this Section from one manufacturer.
- B. Certifications
 - 1. Provide extinguishers that are U.L. listed and bear the U.L. "Listing Work" for type, rating, and classification.
 - 2. Conform to NFPA-10 requirements for extinguishers.
 - 3. Provide units conforming with ANSI/UL 711 and ANSI/UL 92.

1.6 DELIVERY, STORAGE, AND HANDLING.

- A. Deliver, store and handle products in accordance with Section 01600.
- B. Store extinguishers in protected location until after final cleaning is completed.

1.7 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not store products subject to freeze damage in environments where damage could occur.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. JL Industries.
 - 2. Larsens Manufacturing Co.
- B. Substitutions: Submit under provisions of Section 01600.
- C. Larsen's used as a standard of quality in products below where model numbers or styles are indicated.

2.2 FIRE EXTINGUISHERS

- A. Multi-purpose dry chemical type UL 299, (ammonium phosphate), with pressure gage.
 - 1. Capacity: 10.0 lbs.
 - 2. U.L. Rating: 4A:60B:C
 - 3. Acceptable Products:
 - a. Cosmic A Series – Model 10E by JL Industries.
 - 1) Wall Brackets: Mark Series Model MB 846.
 - b. MP10 by Larsens.
- B. Dry chemical type, UL rated, with Pressure Gage.
 - 1. Capacity: 6.0 lbs.
 - 2. U.L. Rating: 40B:C.
 - 3. Acceptable Product: Galaxy Series Model 6 by JL Industries.
 - a. Wall Brackets: Mark Series Model MB 808.
- C. Class K Type Wet Chemical, UL rated, with pressure gage.
 - 1. Capacity: 6 liter
 - 2. U.L. Rating: 1A:K
- D. Accessories:
 - 1. Wall Brackets:

2.3 FINISHES

- A. Extinguisher: Red enamel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.
- B. Beginning of installation indicates acceptance of existing conditions.

3.2 INSTALLATION

- A. Install using skilled workmen in accordance with manufacturer's printed instructions.

3.3 IDENTIFICATION

- A. Identify fire extinguisher locations with the following methods
 - 1. Identify fire extinguisher locations without cabinets, use vertical decal spelling "FIRE EXTINGUISHER" applied to adjacent wall surface.

END OF SECTION

SECTION 10536

FABRIC AWNING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Fabric awning, frame and accessories.

1.2 REGULATORY REQUIREMENTS

- A. Comply with UL Class A-724X fire resistance classification.
- B. Certify that awning is made of flame-resistant fabric and has been granted a Certificate of Flame Resistance.

1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Product Data: Submit manufacturer's catalog cut sheets, data sheets, installation instructions, maintenance data, and fire resistance requirements.
- C. Samples: Submit actual samples of fabric in duplicate.
 - 1. Fabric: 8 inches by 10 inches, labeled with manufacturer's model number and name.
- D. Maintenance Data: Submit maintenance instructions.
- E. Certificates: Certificate of Flame Resistance.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with Section 01600.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Fabric Supplier - Exterior:
 - 1. Cooley /Sign and Awning Products, 50 Esten Avenue, Pawtucket, RI 02860. Contact: Customer Service, 800-992-0072.

2.2 MATERIALS

- A. Fabric: "Weathertyte" as manufactured and distributed by Cooley /Sign and Awning Products.
 - 1. Colors:
 - a. 76 RD Red
 - b. 76 DRD Dk. Red.
- B. Frame:
 - 1. Aluminum:
 - a. 1 inch square 12 gage tubing.
 - b. 3-1/2 inch diameter galvanized tubing.
 - 1) Both Ends to be Capped
 - 2. Milliken Stapling Extrusion by Milliken Wholesale Distribution, 101 South McCall, Englewood, FL 34223, 800.255.0094
- C. Metal Connectors and Fittings: Galvanized or non-corrosive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.
- B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.
- C. Beginning of installation means acceptance of existing conditions.

3.2 EXTERIOR FABRIC AWNING FABRICATION:

- A. After taking field measurements, fabricate awnings and frames.
- B. Fabricate exterior awning frames to the dimensions and shapes detailed on Drawings.
 - 1. Build frames in one piece.
 - 2. All vertical frame members are to be behind the red stripes.
- C. Welding Guidelines - Aluminum Extrusion:
 - 1. Recommended process:
 - a. Mig wire weld process.
 - b. Argon gas.
- D. Fabric seams to be welded, not sewn, and the underside of the Red fabric to be the same color as the top side
- E. Installation shall be as detailed on the Drawings, specified herein, and as approved by the Owner in writing.

3.3 INSTALLATION SCHEDULING:

- A. Schedule installation of fabric awnings after exterior painting and masonry mortar work is complete.

3.4 ADJUST

- A. Replace or repair damaged Work.
- B. Leave Work taut, rigidly and securely anchored and clean.
- C. At completion of installation clean exterior fabric awnings as recommended by manufacturer.

3.5 PROTECTION:

- A. After installation, protect fabric awnings from damage.

3.6 REJECTION:

- A. Rejection by the Owner of this Work shall occur for work performed in an unworkmanlike manner, for flaws in the materials or flaws in the fabrication of the materials, and for sags, tears, patches, ripples or uneven surfaces in the fabric ceilings and awnings, including its related pipe frames and anchoring systems.
- B. Replace materials that have been damaged or otherwise deemed unsuitable by the Owner at Contractor's sole expense. Damaged or unsuitable materials shall be immediately removed from the job site.

END OF SECTION

SECTION 10810

TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Toilet and washroom accessories.
 - 2. Attachment hardware and related trim.

1.2 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Product Data: Submit manufacturer's catalog cut sheets, data sheets, installation instructions, maintenance data, and operating instructions.
- C. Shop Drawings: Submit setting drawings indicating locations of accessories as indicated on the drawings, including methods of attachment.
- D. Samples: Submit actual samples of plastic color chips for selection.
- E. Certificates: Verification of grab bar strength and installation.
- F. Maintenance Data: Submit operating and maintenance instructions for equipment requiring periodic maintenance.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG), ANSI A117.1, or local or state codes, whichever is more stringent, for installing work for accessibility to the handicapped.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with Section 01600.
- B. Pack accessories individually with protective wrappings.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate work with placement of wall reinforcement and reinforcement of toilet partitions to receive anchor attachments. Supply rough-in data in sufficient time to be built into other work.
- B. Do not install accessories until room finishes are completed.

1.6 KEYING

- A. Supply keys for each accessory to Construction Manager.
- B. Master key accessories.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. [San Jamar](#)
[555 Koopman Lane, Elkhorn, WI. 53121. Telephone 262-723-6133.](#)
- B. Substitutions: Submit under provisions of Section 01600.

2.2 MATERIALS

- A. Sheet Steel: ASTM A 366, commercial quality.
- B. Zinc Coating: ASTM A 123.
- C. Chrome Plating: ASTM B 456, Type SC2.
- D. Stainless Steel Sheet: ASTM A 167.
- E. Stainless Steel Tubing: ASTM A 269, stainless steel.
- F. Adhesive: Contact type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized ASTM A386 where concealed; finish to match device where exposed.
- H. Expansion Shields: Type as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from single sheet of stock, free of joints.
- C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.
- E. Shop assemble components and package complete with anchors and fittings.
- F. Provide steel anchor plates, adapters, and anchor components for installation.

2.4 FACTORY FINISHING

- A. Galvanizing: ASTM A 123 to 1.25 ounces per square foot.
- B. Shop Primed Ferrous Metals: Pretreat and clean; spray apply one coat primer and bake.
- C. Chrome/Nickel Plating: ASTM B 456, Type SC 2 satin finish.
- D. Stainless Steel: No. 4 satin luster finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 01450.
- B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.
- C. Check openings for plumbness of blocking and frames.
- D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.
- D. Protect adjacent or adjoining finished surfaces and work from damage during installation.

3.3 INSTALLATION

- A. Install using skilled workmen in accordance with manufacturers' printed instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Locate accessories in order that they do not interfere with door swings or use of fixtures. Install recessed accessories after wall finishes have been completed.
- D. Anchor accessories with bolts, plates, and approved type fasteners. Take down any loose items and repair damaged wall surfaces.
- E. Mount surface mounted accessories to backup material with toggle bolts, plumb and align.
- F. Anchor grab bars to drywall with concealed 16 gage steel anchor plates.

3.4 SCHEDULE

- A. Grab Bars (Item 'L'):
 - 1. Material: 1-1/2 diameter stainless steel, satin finish.
 - 2. Construction: 1-1/2 inch clearance between grab bar and wall.

3. Mounting: Concealed plates with no exposed fasteners.
 4. Acceptable Products: Series B-6106 by Bobrick.
 5. Furnished by General Contractor.
- B. Paper Towel Dispenser (Item "BB"):
1. Surface mounted dispenser.
 - a. Model 59488 as manufactured by Georgia Pacific.
 2. Use at locations as noted on drawings.
 3. Furnished by General Contractor.
- C. Paper Towel Dispenser (Item "BB1"):
1. Custom recessed dispenser
 2. Material: Stainless steel.
 3. Furnished by Kitchen Equipment Supplier.
- D. Toilet Tissue Dispenser (Item "U"):
1. Surface mounted dual roll toilet tissue dispenser.
 - a. Model R3000TBK by San Jamar.
 2. Use at all locations.
 3. Furnished by General Contractor.
- E. Soap Dispenser (Item "O1"):
1. Wall mounted soap dispensers.
 2. Location: As noted on drawings.
 3. Furnished by Owner.
- F. Soap Dispenser (Item "O2"):
1. Wall mounted soap dispenser.
 2. Location: As noted on drawings.
 3. Furnished by Owner.
- G. Baby Changing Station (Item "Z"):
1. Recessed changing station.
 - a. Model KB110-SSRE by Bobrick.
 2. Locate in Public Restrooms as noted on drawings.
 3. Furnished by General Contractor.
- H. Sanitary Napkin Disposal (Item "DD"):
1. Wall mounted sanitary napkin disposal.
 2. Location: As noted on drawings.
 3. Acceptable Product:
 - a. Model B270 by Bobrick.
 4. Furnished by General Contractor.

END OF SECTION

SECTION 11400

FOOD SERVICE EQUIPMENT

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. Installation of Owner-furnished food service equipment.

1.3 DESCRIPTION

- A. Coordinate delivery and installation of kitchen equipment and accessories.
- B. Apply for and pay for necessary special permits that may apply to the trades involved for the complete installation and operation of food service equipment.
- C. The Specification and related Sections found elsewhere, including the food service installation manual and accompanying drawings are intended to describe and identify what is required for a finished piece of work.
- D. Provide labor and materials for the entire completion of the work as intended, fully installed, operating, and ready for the Owner's use.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Acceptable to Owner and Food Service Equipment manufacturer.

1.5 STATUS OF CONSTRUCTION:

- A. Building: Secure; glass, doors, and hardware installed.
 - 1. Temporary adequate plywood security is acceptable.
- B. Interior Finishes: Complete to allow positioning of FSE in or near permanent locations.
- C. Service courtyard, site access, adequate power, and refuse containers available at time of FSE deliveries.

1.6 DELIVERY SCHEDULE:

- A. The Contractor shall receive an updated delivery schedule each week from the Owner identifying the approximate week that major deliveries are scheduled.
- B. Notify Owner 21 days in advance of any date change requirement to this schedule.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Food Service Equipment: Furnished by Owner under separate contracts to various manufacturers for use on this project.

PART 3 - EXECUTION

3.1 RECEIVING FOOD SERVICE EQUIPMENT (FSE):

- A. The Contractor shall be responsible for inventory control of all Owner-Furnished equipment. The Owner will schedule a minimum of 4 deliveries that will require unloading equipment, such as forklifts, etc.
- B. The schedule for delivery equipment will be established to allow as much equipment as possible to be installed without additional storage.

- C. Employ, if necessary, an additional on site representative skilled in receiving, inventory and scheduling for this activity. The Contractor, acting as the Owners representative, shall assist in the filing of damage claims, if requested. The following procedure is for receiving:
 - 1. Verify quantity of containers and compare to delivery ticket and note any discrepancies.
 - 2. Inspect containers for visible external damage and note on delivery ticket.
 - 3. Verify delivery-packing slips with Owners Purchase Order to determine back ordered or short-shipped merchandise.
 - 4. Open containers and verify quantity and condition, arrange for carrier inspection if damaged.
 - 5. Organize, record and label folders for each Purchase Order identifying equipment name, service number and all installation, warranty and maintenance manuals delivered with equipment.

3.2 EXECUTION:

- A. Coordinate installation of food service equipment including final connections of electrical, plumbing and refrigeration and any necessary trades required for a complete installation.
- B. Coordinate and be responsible for the unloading, unpacking, assembly, when required, and placement of food service equipment as indicated.

END OF SECTION 11400

SECTION 12494

ROLLER SHADES

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 roller shades.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
- C. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Product Standard: Provide roller shades complying with WCMA A 100.1.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

- A. Products:
1. **Hunter Douglas, 800-727-8953.**
 - a. **West facing windows: SheerWeave 4400 3%, Eco/Tobacco color, Black Vinyl Cord.**
 - b. **All other windows: SheerWeave 3000 14%, Espresso color, Black Vinyl Cord.**
 2. **Equal by Blind Express, Inc., 30 Mansell Ct, Suite 108, Roswell, GA 30076. Telephone: 770-664-1688, Fax 770-664-1191.**
- B. Shade Band Material: PVC-coated fiberglass.
1. Fabric Width: As indicated on Drawings.
 2. Bottom Hem: Straight.
 3. Trim: As indicated by manufacturer's designation for style and color.
- C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated on Drawings.
- D. Direction of Roll: Regular, from back of roller.
- E. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.
- F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.
- G. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- H. Mounting: Inside mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- I. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.
1. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 3. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 4. Loop Length: Full length of roller shade.
 5. Bead Chain: Stainless steel.
 6. Cord Tensioner Mounting: Wall.
 7. Operating Function: Stop and hold shade at any position in ascending or descending travel.

2.2 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As indicated by manufacturer's designations, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12494

SECTION 12545

RESTAURANT AND BAR FURNITURE

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. Installation of Owner-Furnished restaurant and bar furniture including tables and bases.
 - 2. Coordination with Owner and Owner's separate contractor to facilitate installation of memorabilia and artifacts.
- B. Work Not Included:
 - 1. Installation of memorabilia and artifacts.

1.3 PROJECT CONDITIONS

- A. Surfaces: Complete with final finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Restaurant and Bar Furniture: Owner furnished.
- B. Miscellaneous Installation Accessories: Provide as necessary for proper installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions and as indicated on Drawings.

END OF SECTION 12545

SECTION 13038

COLD STORAGE AND FREEZER ROOMS

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. Installation of Owner-Furnished coolers and freezers.

1.3 SUBMITTALS

- A. The Owner will submit to the Contractor a complete set of approved drawings and installation instructions at the start of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Preassembled Panel Assembly:
 - 1. Standard W.I. Cooler/Freezers are pre-fabricated and delivered as a complete unit to include wall panels, floor panels, doors, roof panel assemblies, roof membrane with sloped insulation, and accessories.
- B. Screeds:
 - 1. Approximately 1-1/2 inch high screeds. Screeds shall be secured to concrete slab as recommended by box manufacturer. No exposed fasteners shall be allowed. Install screed "skirt" and seal to concrete slab.
 - 2. To supply and install condenser unit; refer to equipment drawings and schedules.
- C. Entrance Door:
 - 1. Each walk-in shall be fitted with one standard 34 inch by 78 inch swing-type entrance door. The door shall be flush type, finished in and out to match the wall in which located. Doors and door section shall be listed by Underwriters Laboratories and equipped with the following:
 - a. Door shall be equipped with magnetic gasket, door closure and latch to open the door by breaking the magnetic force of the gasket. Hardware has provisions for locking and a safety release, which prevents entrapment of personnel within the box.
 - b. Door shall be self-closing with two strap-type, cam-lift hinges and bottom sweep gaskets.
 - c. Door jamb shall be made of extruded aluminum with a thermal break. An isolated, low wattage heater strip covered by magnetically attracting stainless steel shall be fitted onto this jamb at freezer doors only.
 - d. A heavy gauge threshold with non-skid stripping shall be provided with each door section.
- D. Flashing:
 - 1. Flashing to be supplied by Contractor as detailed and specified herein.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation instructions. A complete set of installation instructions shall be included with the walk-in. These instructions shall cover the installation of the walk-in. A floor plan print shall be included.

3.2 INSTALLATION

- A. The cooler/freezers are pre-assembled with Posi-Locs (a cam-action locking system). Posi-Locs shall be foamed-in-place and activated by a hex wrench provided by the manufacturer. Access ports to locking devices shall be covered by snap caps. Access ports shall be on interior to allow assembly of walk-in from the inside. The following are guidelines for Contractor reference only. The installing Contractor must follow printed instructions that accompany the cooler/freezers.
 - 1. The cooler freezer assembly will be delivered under separate contract with the owner. The General Contractor is responsible for final setting in place to include all waterproofing, installation of roof membrane, and flashing.
 - 2. Seal joint between floor tile and cooler floor as illustrated on cooler manufacturer's details for pre-finished cooler floor and quarry tile kitchen floor.
 - 3. Door Threshold Plate Installation:
 - a. Remove the threshold and apply a bead of sealant along the outer edges, near screw holes. Properly placed, the threshold will be sealed to the floor. Replace threshold and drill 9/64 inch diameter holes through pre-drilled holes in threshold plate. Screw with stainless steel flat head screws.
 - b. Low voltage heater wire for jambs and thresholds not to be hooked up (final) until refrigeration system is operating.
 - 4. Installation of refrigeration system and plumbing are as specified in Division 15 - Mechanical and Division 16 - Electrical.

3.3 CLEANING

- A. Immediately after installation of walls and ceiling, clean all aluminum panels with a mild detergent to remove all fingerprints and construction marks. Follow immediately with a clean rinse and dry with soft cotton rags. The entrance doors must be left open to allow excess moisture to evaporate. All doors must be kept in an open position until the refrigeration system is in operation.

END OF SECTION 13038

SECTION 15400

PLUMBING GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work described in these Specifications and/or indicated on the Drawings shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all systems. All work shall be accomplished by workmen skilled in the various trades involved.
- C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the Engineer shall be notified of the discrepancy.
- D. All work performed under this specification shall be accomplished in accordance with the requirements and provisions of the following sections:
 - 1. Section 01600 Sustainable Design Requirements
 - 2. Section 01700 Facility Environmental Requirements
 - 3. Section 01734 Indoor Air Quality Requirements
 - 4. Section 01810 Commissioning
 - 5. Section 15400 - Plumbing General
 - 6. Section 15000 - HVAC General
 - 7. Section 16000 - Electrical General

1.2 STANDARDS

- A. All Plumbing systems shall conform to all ordinances and regulations of the City, County, State and/or other authorities having jurisdiction in accordance with the requirements of the following codes, standards and design guides.
 - 1. The International Plumbing Code, 2012 Edition, with most current State of West Virginia Amendments
 - 2. The International Building Code, 2012 Edition, with most current State of West Virginia Amendments
 - 3. The International Fuel Gas Code, 2012 Edition, with most current State of West Virginia Amendments
 - 4. International Energy Conservation Code, 2013 Edition, with most current State of Georgia Amendments
 - 5. Americans with Disabilities Act (ADA)
 - 6. ANSI/NSF 61, NSF 372, and NSF 61-G compliance is required for all components of the domestic potable water system.
 - 7. American Society of Plumbing Engineers (ASPE) Data Books
 - 8. Sovent Cast Iron Design Manual No. 802, latest edition
 - 9. National Fire Protection Association (NFPA) Standards:
 - a. NFPA 30 - Flammable and Combustible Liquids Code
 - b. NFPA 31 - Oil Burning Equipment
 - c. NFPA 54 - National Fuel Gas Code
 - 10. Plumbing Drainage Institute (PDI)
 - 11. Underwriters Laboratories Inc. (UL)

12. National Sanitation Foundation (NSF)
13. Local and State Fire Marshal requirements
14. Local Building and Inspection Department requirements
15. Local Health Department requirements
16. ASHRAE 90.1-2007

B. If code or other requirements exceed the provisions shown on the Contract Documents, the Engineer shall be notified in writing. Where requirements of the Contract Documents exceed code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.3 PERMITS

A. The Contractor shall obtain all permits and inspections required for the installation of this work and pay all charges incident thereto. He shall deliver to the Architect all certificates of said inspection.

1.4 WORK INCLUDED

A. Systems

1. The Plumbing Systems installed and work performed under this Division of the Specifications shall include, but not necessarily be limited to, the following as noted below. The connection point for all systems from the site utilities shall be as 5'-0" from the exterior of the building unless specifically otherwise noted.
 - a. Domestic cold, hot and hot water recirculation systems
 - b. Sanitary, drainage, waste and vent systems
 - c. Natural gas/propane gas system
 - d. Primary and emergency storm drainage systems
 - e. Propane/air mixture gas systems
 - f. Grease waste and waste systems from food service areas
 - g. Domestic water softening system
 - h. Compressed air system
 - i. Fuel Oil system

1.5 DRAWINGS

- A. The Drawings are diagrammatic and do not necessarily depict exact conditions. The indicated locations of equipment, ductwork, piping, etc. are approximate only. The Drawings are schematic in nature and are not to be scaled. Scales are shown for reference and approximation only. Refer to the architectural drawings for dimensional data of building components.
- B. The locations, arrangement and extent of equipment, devices, and other appurtenances related to the installation of work shown on the Drawings are approximate. The Contractor shall not scale drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy for resolution.
- C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

1.6 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare a minimum of two (2) instruction manuals, one of which shall be submitted to the Architect for the Engineer's review, describing installation, operation and maintenance of all Plumbing equipment. Manuals shall include copies of control schematics, sequences of operations, indicate the function and operations of all

components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturers' drawings, pamphlets, data, parts lists and instructions manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in a 3-ring binder(s).

- B. The Contractor shall give detailed instructions for a period of not less than two (2) days to the responsible personnel designated by the Owner in the operation and maintenance of all equipment furnished under this Contract. A letter containing the name of the person or persons to whom the instructions were given and the dates of instruction period shall be submitted to the Engineer in the as-built submittal.
- C. Prior to final acceptance by the Owner, the Contractor shall submit a complete as-built drawing submittal for the Engineer's review, three (3) sets of operating and maintenance manuals, spare parts lists, drawings, wiring diagrams, troubleshooting data, manufacturer's bulletins, and other pertinent data on all equipment furnished under this Contract. Each set shall be enclosed in a suitable hard cover binder.
- D. A complete set of reproducible as-built drawings shall be provided indicating the location of all piping dimensionally located from a minimum of two column lines or major building structures. Drawings shall be a minimum of 1/8" scale.
- E. Provide name, address and telephone numbers of the manufacturer's representative and service company for each piece of equipment installed in the as-built submittal package.
- F. Provide all loose keys for supply valves, wall hydrants and hose bibbs installed.
- G. Provide a full repair kit set (total relief valve kit, first check and second check kits) for each reduced pressure backflow preventer installed.

1.7 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a record set of drawings indicating all changes in the work from that shown in the Contract Documents. Prior to final acceptance by the Owner, the Contractor shall assemble the complete set of as-built drawings that accurately reflects all changes to indicate actual final construction. All concealed piping shall be dimensionally located from at least two (2) column lines or major building structure elements. Drawings shall be a minimum of 1/8" scale.
- B. The original set of "as-built" drawings shall be scanned and transmitted to the Architect in both full size mylar and CD format.

1.8 EQUIPMENT, MATERIAL BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the Drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in Specifications or on Drawings as "base" products. Proposed alternate equipment and materials may be submitted along with the "base" products, provided deductive pricing is included with the alternate.
- C. Alternate "approved equal" items listed shall conform to specified base items and shall be substantially equal in quality, size, weight, construction, capacities and performance. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. The Engineer shall consider the use of the alternate equipment based on the supportive documentation and other information available to him, and shall approve or disapprove any alternates. The decision of the Engineer shall in all cases be final.
- D. The Contractor shall coordinate the installation of all plumbing equipment proposed for use in this project with all building trades (architectural, structural, mechanical and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at

no additional cost. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.9 START-UP-SERVICE

- A. The service of a factory-trained representative shall be provided on the jobsite for a minimum of one (1) day to provide the manufacturer's certification and start-up of all major equipment and systems including booster pumps, water heaters, sewage ejectors, lift stations, fuel oil systems, etc. A formal report is to be issued indicating any revisions required for certification of the assembly by the manufacturer. Instruction and training of the operator's personnel shall be provided following certification of the assembly.

1.10 SUBMITTALS

- A. The Contractor shall prepare, submit, and obtain Engineer's review of manufacturers' submittals on the following equipment and systems prior to ordering, purchasing, or installation of any equipment or materials. All required submittals shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review.
 - 1. Plumbing fixtures, faucets and trim
 - 2. Water heaters and storage tanks
 - 3. Insulation
 - 4. Floor drains and drainage accessories
 - 5. Hydrants and hose bibbs
 - 6. Mixing valves
 - 7. Hot water return pumps
 - 8. Backflow preventers
 - 9. Grease/oil interceptors
 - 10. Pipe and fittings
 - 11. Grooved joint couplings
 - 12. Valves
 - 13. Pipe supports
 - 14. Piping accessories
 - 15. Pipe labels and valve tags
- B. All approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to equipment being submitted to the Engineer.
- C. Quality Assurance/Control Submittals: Submit the following:
 - 1. Test Reports: Upon request, submit test reports from recognized testing laboratories.
 - 2. Certificates: Submit the following:
 - a. Manufacturer's certificate that products comply with specified requirements.
 - b. Certificate indicating that the installer is authorized to install the manufacturer's products
- D. Review of submittals by the Engineer does not relieve the Contractor from the responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements of all approved equipment with other trades and disciplines such as roof openings, wall openings, electrical characteristics, etc.
- E. All submittals shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.
- F. Submittals shall clearly indicate selection of model numbers, sizes, dimensions, electrical characteristics, etc. of the proposed equipment. Any proposed deviations from specified equipment shall be clearly indicated on the submittal.

- G. Included with submittals of plumbing equipment requiring electrical connections shall be a written statement confirming coordination of voltage requirements, bearing the names and signatures of the plumbing and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the Electrical Drawings, as well as with the electrical contractor.

Plumbing Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

Electrical Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

- H. Provide Material Safety Data Sheet (MSDS) or letter from manufacturer certifying the VOC content for each adhesive, sealant, paint and coating.
- I. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01600 Sustainable Design Requirements.

1.11 RENOVACTIONS AND ADDITIONS

- A. Prior to the ordering or purchasing of any plumbing equipment or materials or the layout or installation of any work, the Contractor shall examine the premises and verify any and all of the existing conditions under which he will be required to operate, or that will in any manner affect the work under this Contract.
- B. Active Services: When encountered in work, protect, brace, and support existing active sewer, gas and other services required for proper execution of the work. If existing active services are encountered that require relocation, relocate as shown on the Contract Documents or as necessary. Do not prevent or disturb operation of active services that are to remain. Notify utility companies or municipal agencies having jurisdiction.
- C. Interruption of Services: Where work makes temporary shutdown of services unavoidable, shut down at night or at such times as approved by Owner, which will cause the least interference with scheduled operations. Arrange work to assure that services will be shut down only during time actually required to make the connection to the existing work.
- D. The existing system installations removed or damaged shall become the property of the Contractor and shall be removed from the project site. Existing ductwork, pipe insulation, equipment or material damaged by the Contractor while performing any work shall be replaced with new materials to match existing conditions.
- E. Where work under this project requires extension, relocation, reconnection or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original and operating condition.
- F. All pipe, fittings, insulation, supports, etc. removed in the renovation area are to be removed from the site. No existing pipe or materials are to be removed and reused on the renovation.

1.12 COORDINATION OF TRADES

- A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B. Piping and other plumbing equipment shall not be installed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated piping and other plumbing equipment installed should they interfere with the proper installation and mounting of electrical, HVAC equipment, ceilings and other architectural or structural finishes.
- C. The Contractor shall coordinate the elevations of all piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.
- D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.
- E. The Contractor shall confirm that work installed under this section does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.
- F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.
- G. All offsets, fittings, valves, devices and accessories which may be required are to be provided under this Contract. The Contractor shall examine the entire set of Contract Documents and carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly for the complete satisfactory operation of all systems, providing such fittings, traps, valves, devices and accessories as may be required to meet such conditions.

1.13 WARRANTY

- A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.
- B. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Contract Documents shall be suitable for the intended use and shall be subject to approval by the Engineer.
- B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.
- C. All equipment shall bear the inspection label of Underwriters Laboratories Inc.
- D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.
- E. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- F. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.
- G. Cast iron soil pipe and fittings shall bear the collective trademark of the Cast Iron Soil Pipe Institute.

2.2 ELECTRICAL WORK

- A. Except as otherwise specified or noted, electrical equipment used for plumbing systems shall be as specified herein.
- B. Motor controls, system controls, starters, disconnects, pilot lights, push buttons, etc. shall be furnished by the Contractor compatible with the apparatus that it operates. Electrical equipment shall be wired for the voltage, as shown on the Electrical Drawings.
- C. The Contractor shall be responsible for coordinating and furnishing equipment of voltage shown on the electrical documents.
- D. Electric motors shall be high efficiency, open drip-proof type unless otherwise specified. Motors shall be standard NEMA continuous duty type and shall bear the UL Label. Motors shall be selected with a minimum of 15% safety factor greater than the fan brake/horsepower (e.g. 4.75BHP would require a nominal 7-1/2 HP motor). The motor service factor shall not be used as part of the safety factor. All motors shall have thermal overload protection. Motors shall meet Table MG-1-12C of EPACT 1992.
- E. Motors controlled by a variable frequency drive (VFD) shall be inverter duty rated and fully compatible with the VFD provided.
- F. Starters for motors 1/3 HP and smaller shall be manual type, and for 1/2 HP and larger, shall be magnetic type. Starters shall be minimum size 0, combination type (with disconnect and lockable handle) with molded case circuit breaker. Starters for motors with remote or automatic control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.
- G. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type unless otherwise indicated on the Drawings or specified herein.
- H. Motor controls shall be either "Hand-Off-Auto" switches or "On-Off" push buttons with one indicating light. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.
- I. Motor starters that are not an integral part of equipment shall be installed in conformance with Division 16 - Electrical Requirements.
- J. All "loose" disconnects and starters shall be installed by Division 16.
- K. Power wiring to disconnects, starters, and equipment shall be provided and installed by Division 16. All equipment requiring electrical power shall be provided with disconnect switches at each piece of equipment. Coordinate switch type (fused or non-fused) with equipment characteristics, manufacturer's recommendations and Electrical Drawings.
- L. Provide all system controls and associated control and interlock wiring for complete and operable systems. 120 volt and higher wiring shall be MC cable or in conduit in accordance with local codes and the materials and installation requirements of Division 16 - Electrical.
- M. All starters for 3-phase equipment shall have overload devices in all three (3) phases.
- N. All starters and variable frequency drives shall be labeled on the face of the device with a semi-rigid plastic laminate nameplate with 1" high white letters on a black background securely affixed to the equipment. The label shall indicate equipment served (equipment tag used on the Drawings). Labels shall be furnished and installed by the Contractor.
- O. Wiring diagrams shall be furnished by the Contractor.
- P. Acceptable manufacturers shall be General Electric, Square D, Eaton, Siemens and Allen Bradley.

2.3 PIPING SYSTEMS

- A. General
 - 1. The various piping systems are classified as follows, and materials of construction shall be as specified unless otherwise noted on the Drawings.
 - 2. Piping, valves and equipment used in similar applications shall be provided from the same manufacturer unless noted otherwise.
- B. Domestic Cold Water System, Underground, 3 Inches and Larger, Suitable for Working Pressure of 125 psig to 5'-0" Outside Building
 - 1. Piping Systems

- a. Basis of Design
 - 1) Ductile iron thickness Class 51 for 3 inch and 4 inch size thickness, Class 50 for 6 inches and larger, ANSI A21.51, ASTM A746 with bituminous coating outside and cement mortar lining inside. Ductile iron mechanical or push-on joints and fittings ANSI/AWWA C110/A21.10.
 - 2. All valves, fittings, and changes in direction or elevation shall have joints restrained in accordance with NFPA-24.
 - 3. Trenching Conditions: Class B1 bedding with 4" minimum thickness of clean granular fill. Recesses shall be provided at all pipe barrels to ensure no loads are transmitted at the joint connections.
- C. Domestic Water System Branch Piping, Underground, 2 Inches and Smaller, Suitable for a Working Pressure of 125 psig
 - 1. Piping Systems
 - a. Copper Type L, soft annealed, conforming to Federal Specification WWT-799. Joints and fittings are not permitted below floor slabs with copper Type K soft annealed pipe.
- D. Domestic Cold Water and Hot Water Systems Above Ground
 - 1. Piping Systems
 - a. Basis of Design
 - 1) Type "L" hard drawn copper tubing per ASTM B-88 and Federal Specification WWT-799. Piping, fittings, and joints to comply with NSF 61-G, NSF 61, and NSF 372. Fittings: Solder or brazed joint copper fittings per B16.18 or 16.22. Grooved copper fittings with full flow radius elbows; wrought copper to ASME B16.22 and ASTM B-75, or cast bronze to ASME B16.18 and ASTM B-584, Victaulic CTS system, or Engineer approved equal. Copper pressed fittings with radius elbows, crimped connections and EPDM O-rings, ASTM B-88, 200 psi rating, Ridgid Viega ProPress, ProPress XL or Elkhart Xpress systems. Ductile iron mechanical couplings with bolted connection for grooved piping, ASTM A-536, housings with offsetting angle-pattern bolt pads, with EPDM-HP copper tube size gaskets, rated working pressure 300 psi, installation-ready for direct stab installation without field disassembly. Basis of Design: Victaulic Style 607H. Joints: Soldered or brazed joints with lead-free brazing filler materials and compatible alloys.

Temperature	Pipe Sizes	Type L Drawn Copper Tubing Permissible working pressures using NO LEAD SOLDERED FITTINGS (psi)	Type L Drawn Copper Tubing Permissible working pressures using PRESS FITTINGS (psi)	Type L Drawn Copper Tubing Permissible working pressures using ROLL GROVE FITTINGS (psi)
100	½"-1"	1090	200	300
	1¼"-2"	850	200	300
	2½"- 4"	705	200	300
	5"-8"	660	N/A	300
	10"-12"	500	N/A	
150	½"-1"	625	200	300

Temperature	Pipe Sizes	Type L Drawn Copper Tubing Permissible working pressures using NO LEAD SOLDERED FITTINGS (psi)	Type L Drawn Copper Tubing Permissible working pressures using PRESS FITTINGS (psi)	Type L Drawn Copper Tubing Permissible working pressures using ROLL GROVE FITTINGS (psi)
	1¼"-2"	485	200	300
	2½"- 4"	405	200	300
	5"-8"	375	N/A	300
	10"-12"	285	N/A	
200	½"-1"	505	200	300
	1¼"-2"	395	200	300
	2½"- 4"	325	200	300
	5"-8"	305	N/A	300
	10"-12"	230	N/A	

- 2) For pipe sizes 2" and smaller, the Vic-Press system for Schedule 10S pipe may be used in lieu of soldered copper. The system shall be rated to 500-psi CWP, with grade EPDM gaskets, UL classified in accordance with ANSI/NSF-61 for potable water service.

E. Sanitary, Waste and Vent and Storm Drain Systems, Below Ground to 5'-0" Outside Building

1. Piping Systems

a. Basis of Design

- 1) Service weight hub and spigot cast iron soil pipe per ASTM A-74, coated on outside. Fittings: Service weight hub and spigot cast iron soil pipe fittings per ASTM-A-74, coated on outside. Joints: Neoprene gasketed joints per ASTM C564 and ASTM C 1563.
- 2) No-hub cast iron soil pipe per CISPI 301 and ASTM A888. Fittings: No hub cast iron fittings per CISPI 301 and ASTM A888. Joints: Cast iron mechanical couplings with neoprene gaskets and stainless steel nuts and bolts. Heavy duty type 304 stainless steel shielded couplings, ASTM C1540. Acceptable manufacturers: Husky SD 4000 or Clamp-All 125.

b. Deductive Alternates

- 1) Schedule 40 DWV PVC pipe, ASTM 1785. Install per ASTM D 2321. Fittings: Schedule 40 DWV PVC, socket type fittings, ASTM 2665. Joints: Solvent joints for PVC, ASTM D-2564. (PVC piping is not acceptable for waste piping receiving discharge higher than 130 degrees F, cast iron piping is to be installed at the central plant, mechanical rooms and at all laundry and kitchen equipment discharges.)

- c. Single and double sanitary tee fittings are not allowed for the piping to any plumbing fixture; combination wye and eighth bend fittings shall be installed.

- d. Double combination fittings shall not be used for connections to horizontal drainage piping; single wye and eighth bend fittings shall be used for all connections.
 - e. Foam core PVC piping is not acceptable for any drainage system.
 - f. All cast iron pipe and fittings shall carry an NSF International listing.
- F. Sanitary, Waste and Vent Systems and Storm Drainage Systems Above Ground
- 1. Piping Systems
 - a. Basis of Design
 - 1) No-hub cast iron soil pipe per CISPI 301 and ASTM A888. Fittings: No-hub cast iron fittings per CISPI 301 and ASTM A888. Joints: Joints for no-hub pipe and fittings shall be per CISPI 310, with stainless steel clamps and neoprene sleeve conforming to ASTM D 564. Heavy duty couplings are required on no-hub systems at the base of stack and vertical to horizontal offsets on all sanitary, waste and storm drainage systems. Heavy duty couplings shall conform to the requirements of ASTM Standard C-1540 and shall be type 304 stainless steel shielded couplings with stainless steel worm gear clamps, 15 psi working pressure. Acceptable manufacturers: Husky SD 4000 or Clamp-All 125.
 - 2) Type DWV copper tube per ASTM B-306 and ANSI H-23.6. Fittings: DWV solder joint fittings per ANSI B16.29 or B16.23. Joints: All solder joints shall be made with a solder consisting of 95% tin and 5% antimony.
 - 3) Single and double sanitary tee fittings are not allowed for the piping to any plumbing fixture; combination wye and eighth bend fittings shall be installed.
 - 4) Double combination fittings shall not be used for connections to horizontal drainage piping; single wye and eighth bend fittings shall be used for all connections.
 - 5) All cast iron pipe and fittings shall carry an NSF International listing.
 - b. Deductive Alternates
 - 1) Polyvinyl Chloride (PVC), schedule 40 DWV PVC pipe, ASTM 1785. Fittings: Schedule 40 DWV PVC, socket type fittings, ASTM 2665. Joints: Solvent joints for PVC, ASTM D-2564. PVC piping is not acceptable in plenum ceilings or for waste piping receiving waste discharge higher than 130 degrees F, such as from laundry and kitchen equipment.
 - c. Single and double sanitary tee fittings are not allowed for the piping to any plumbing fixture; combination wye and eighth bend fittings shall be installed.
 - d. Double combination fittings shall not be used for connections to horizontal drainage piping; single wye and eighth bend fittings shall be used for all connections.
 - e. Foam core PVC piping is not acceptable for any drainage system.
 - f. All cast iron pipe and fittings shall carry an NSF International listing.
- G. ProSet Fittings
- 1. Cast in place fire penetration sleeves such as ProSet and Holdrite Hydro Flame may be installed in lieu of block-outs and/or steel sleeves only in areas where the design ceiling clearances are maintained.
 - 2. Code Red stack assemblies manufactured by ProSet Systems are not an acceptable fire stopping method for any system.
- H. Beverage Conduit

1. Piping Systems
 - a. Above grade - Galvanized electrical metallic tubing (EMT), UL Standard 797, ANSI C80.3. Fittings: Galvanized electrical metallic tubing (EMT) long radius sweeps, 18" minimum radius. Threaded or set screw type couplings.
 - b. Below grade - Schedule 40 PVC pipe, ASTM 1785. Fittings: Schedule 40 PVC long sweep socket type fittings, ASTM 2665.
 - c. .

2.4 VALVES, FLANGES AND UNIONS

A. General

1. All systems under this section shall be provided with valves to permit complete and sectional control of the system. They shall be located to permit easy operation, replacement and repair. They shall be installed where shown on the Drawings, or as herein specified. Valves to comply with NSF 61-G, NSF 61, and NSF 372. Valves shall be as manufactured by one of the following companies: American, Anvil International, FNW, Kennedy, Kitz, Milwaukee, Nibco, Powell, Stockham, Victaulic, Watts, or approved equal, and shall conform to description listed below.
2. All individual guestroom riser shut-off valves shall be located in the chase space adjacent to the vanity with access panels located tight to the underside of the countertop concealed from view unless specifically noted otherwise. Access panels serving the hot water recirculation balancing valves shall be located above ceiling in the guestroom closet unless otherwise noted. No access panels will be allowed in the public spaces with gypsum ceilings.
3. Control valves shall be provided for the domestic hot and cold water supply to all risers and specific areas such as restrooms, fixture groups, equipment, hose bibbs and wall hydrants, food service areas and building separations. Valves shall be located in back-of-house or service areas with access panels or above lay-in ceilings. No access panels will be permitted in public spaces with gypsum ceilings. The tower riser control valves will be provided with an access panel concealed below the lowest guestroom vanity or above the ceiling in the closet in the lowest level unless specifically noted otherwise.

B. Valve Description

1. Gate Valves
 - a. 2-1/2" and larger, [Victaulic Series 771V](#) grooved ends (steel pipe), Stockham G-634, 175 lb. flanged OS&Y.
 - b. 2" and smaller, [Milwaukee UP149](#), low lead, 125 lb., sweat connection. 2-1/2" and larger, Victaulic MasterSeal (steel pipe) and Series 608 (copper tubing); Milwaukee Fig. F-2885, 125 lb., flanged or Apollo 141WD-SE-1 lead free Butterfly valve with 10 pos. lever handle.
 - c. 8" and larger, Apollo141WD-SE-2 lead free Butterfly valve with gear operator.
 - d. 2-1/2" and smaller, [Milwaukee BB-SC100](#), threaded.
2. Check Valves
 - a. 2" and smaller, [Milwaukee UP509](#), 200 lb., threaded, low lead.
 - b. 2" and larger, Victaulic Series 716, grooved ends.
 - c. 2-1/2" and larger, Milwaukee Fig. F-2974, 125 lb. flanged.
 - d. 2-1/2" and larger, Stockham G-939, 175 lb. flange.
3. Ball Valves
 - a. 2" and smaller, [Milwaukee UPBA 100](#).
4. Plug Valves (Natural/Propane Gas System)

- a. 1/2" and larger, Rockwell Nordstrom Fig. 142 or 143 lubricated plug valve, threaded or flanged as required, wrench operated.
 - b. 1/2" through 2", two-piece full port brass ball valve, FM and AGA approved, [Watts series FBV-3](#) or equal.
5. Balancing Valves (Hot Water Recirculation)
- a. Balancing valves shall be venturi orifice type, bronze or brass body globe type or with brass or chrome ball, a minimum of two differential pressure read-out ports, 300 psi minimum working pressure. A compatible positive shutoff ball valve with memory stop is to be provided if not included with the balancing valve assembly.
 - b. Balancing valves shall be Victaulic Series 786 / 787, Flow Design Incorporated (FDI) model AC or MC or approved equal by ITT or Bell and Gossett.
 - c. Ball valves are not acceptable for balancing the hot water return system.
6. Backflow Preventers
- a. Backflow preventers shall be installed at all locations required by code and local authorities, at all connections to mechanical equipment, and elsewhere as shown on the Drawings. Backflow preventers shall be reduced pressure principle type and shall be a complete assembly including tight-closing shutoff valves before and after the device. The design shall include test cocks and a pressure-differential relief seating check valves. The device shall meet the requirements of and be certified by ASSE Standard 1013, AWWA Standard C-506, NSF 61-G, NSF 61, NSF 372, and USC Foundation for Cross-Connection Control. A strainer shall be located upstream of the device. Route relief outlet from cone receptor to an air gap fitting for discharge to sanitary sewer.
 - b. Acceptable manufacturers are Ames Company, Apollo Valves, Hersey Products, Watts Regulator, and Zurn-Wilkins.
7. Class II turbine type water meters shall be installed downstream of the backflow preventer, on the domestic water supply to HVAC equipment make-up, irrigation supply, and pool/fountain supply to allow for a reduction in sewer rate charges.
8. Pressure Reducing Valves
- a. A duplex pressure reducing valve station shall be provided on all domestic water systems greater than 80 psi.
9. Flanges
- a. All flanges shall be faced and drilled for not less than 125 pounds steam working pressure complete with necessary adapter, and shall be of size and material of adjacent piping. All flanges shall be faced (raised or flat) to be compatible with connecting valves, equipment, etc. The connection of one raised face flange to a flat face flange shall not be permitted.
10. Unions and Joints
- a. Unions on drainage pipes on fixture side of traps may be slip or flanged joints with soft rubber washers or gaskets. Unions 2" and smaller on copper pipe shall be all brass with ground joint and shall be 250# copper to copper. Unions above 2" shall be flanged with gaskets. Provide union at water and gas connection to all equipment, except plumbing fixtures.
 - 1) Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)
 - b. Bathtub waste and overflow joints shall be soldered if required by local authorities to eliminate the requirement for an access panel to bathtub drain connection.

2.5 CLEANOUTS

- A. Cleanouts shall be provided where indicated on Drawings and elsewhere as required by code.
 - 1. Cleanouts in pipelines shall consist of cast iron ferrule and heavy duty cleanout plug with square head as scheduled on the Drawings. Where piping is concealed in floors or walls cleanouts shall be installed in or near surface of floor or walls and have countersunk plugs with covers.
- B. Cleanouts shall be provided at the base of the stack on all sanitary, waste and drainage stacks. Base of stack cleanouts on piping located within walls or partitions shall be cast iron cleanout tee with countersunk plug and chromium-plated round access cover, [J.R. Smith figure 4530](#) or approved equal.
- C. Base of stack cleanouts on hotel, condominium student housing, multi-family projects, etc. shall have the stack located behind the water closet at the lowest level to allow for concealing the base of stack cleanout behind the tank of the water closet.
- D. Brass cleanouts shall be solid nut construction.
- E. Provide Owner with three (3) wrenches for removing flush cleanout plugs.

2.6 FLOOR DRAINS

- A. Setting Grades
 - 1. The plumbing contractor shall obtain exact elevation of finished grade at the top of the drains prior to setting any drains. Drains installed in excess of 1/4" below the adjacent finished floor shall be removed and reset to the correct elevation.
- B. Drain Types
 - 1. All floor drain outlets shall be of size noted on the Drawings. All drains shall be equal to the assembly specified. Acceptable manufacturers are as follows: Josam Co., Zurn Co., J.R. Smith Co., Wade, or approved equal. Drains shall be acid-resisting where indicated.
 - 2. Floor drains noted as FD "CT" for use at cooling towers shall be [Jay R. Smith Figure 3960](#) cast iron drain with domed strainer, 10-1/2" diameter.
 - 3. Floor drains noted as FD "DD" for use in deck drainage applications shall be [Jay R. Smith Figure 1412-HP](#), C.I. drain with 13" square heel proof grate, D.I. undergrate with nickel bronze strainer.
 - 4. Floor drains noted as FD "G" for use in public spaces such as Restrooms, Locker Rooms, Showers, etc., shall be general purpose type. Drains shall be cast iron with 6" square nickel bronze strainer and trap primer connection. Drains shall be Jay R. Smith Figure [2005B-L-B6-P050](#) or approved equal.
 - 5. Floor drains noted as FD "K" for use in food service areas shall be general duty type, cast iron, with flashing collar, sediment bucket, nickel bronze, and 6" square nickel bronze strainer. Drains shall be [Jay R. Smith 2010-B6-B](#) or approved equal.
 - 6. Floor drains noted as FD "F" for use at equipment discharge areas requiring a funnel shall be general purpose type. Drains shall be cast iron with 6" square nickel bronze strainer and sediment bucket with 4" diameter secured funnel, and trap primer connection. Drains shall be [Jay R. Smith Figure 2005/2010-B6-F12-B](#) series or approved equal.
 - 7. Floor drains noted as FD "M" for use in mechanical rooms shall be heavy duty type. Drains shall be cast iron shallow type, 12" diameter with ductile iron tractor grate, sediment bucket, and trap primer connection. Secured funnels shall be provided on all drains receiving condensate discharge to eliminate overflow or spillage. Drains shall be [Jay R. Smith Figure 2142 series](#) or approved equal. Drains located within rooms considered to be a plenum are to be provided with a deep seal trap and trap primer.
 - 8. Floor sinks noted as "FS" for use in food service areas shall be cast iron with acid resistant coating, 12" square x 8" deep, aluminum or cast iron dome bottom strainer (plastic strainers are not acceptable), nickel bronze half or three-quarter grate as required by the equipment served. The solid portion of the grate shall

- be located to the front of the equipment; the open section of the grate shall be located at the rear of the equipment for receipt of the indirect waste. Floor sinks shall be [Jay R. Smith figure 3430 series](#).
9. Floor drains noted as FD "HC" for use in the spa treatment rooms shall be general duty type, cast iron with flashing collar, sediment bucket, 6" square strainer with solid hinged cover, nickel bronze finish, trap primer connection. Drains shall be [Zurn model Z415SC-ZN-Y](#), no equals.
 10. Floor drains noted as FD "P" for use in planter drains with standpipes shall be [Jay R. Smith Figure 2685](#), C.I. drain with bronze standpipe and dome, field-verify exact height required.
 11. Floor drains noted as FD "PD" for use in parking deck drainage areas shall be [Jay R. Smith Figure 2142-M](#), C.I. drain with 11-½" ductile iron grate sediment bucket.
 12. Floor drains noted as FD "R" for use at refrigerator/freezer condensate discharges shall be [Jay R. Smith Figure 2005 Series](#) C.I. drain with 7" diameter F37 nickel bronze raised strainer mounted above finished floor, and trap primer connection.
 13. Floor drains noted as FD "TD" for use at trench drains in parking deck areas shall be Zurn flow-thru system, [Z-812 Series](#), 12" wide, 4" outlets, Z-812-HPD ductile iron heel proof grate.
 14. Green roof planter drains labeled "GR" shall be cast iron body with flashing clamp, perforated stainless steel extension, gravel stop and rough bronze dome. Coordinate the required extension height with the Architect prior to ordering. The entire drain is to be wrapped with filter fabric to minimize blockages. [Jay R. Smith 1017-RBD](#).
 15. Green roof planter emergency drains labeled "GRE" shall be cast iron body with flashing clamp, PVC standpipe, gravel stop and rough bronze dome. Coordinate the required standpipe height with the Architect prior to ordering. The entire drain is to be wrapped with filter fabric to minimize blockages. [Jay R. Smith 1070-RBD](#).
 16. Floor or hub drains located within rooms considered to be a plenum are to be provided with a deep seal trap and trap primer.
 17. Unless otherwise noted, acceptable manufacturers shall be Josam, Jay R. Smith, Mifab, Watts, and Zurn.
- C. Trap Primers
1. Drains not receiving a continuous discharge are to be provided with an automatic trap primer.
 2. Trap primers shall be in-line type actuated by flow independent of pressure, pressure activated primers are not acceptable. [Josam models 88250](#) and 88300.
- D. Roof Drains
1. Roof drains labeled "RD" installed in poured concrete slab shall have a cast iron body with combined flashing and gravel stop, cast-iron dome. [Jay R. Smith 1010](#) or approved equal.
 2. Roof drains labeled "RD" installed in steel construction or built-up roof shall have a cast iron body with combined flashing and gravel stop, underdeck clamp and sump receiver, adjustable extension and cast iron dome. [Jay R. Smith 1015-R-C](#) or approved equal.
 3. Emergency roof drains labeled "ERD" shall have a cast iron body, combined flashing and gravel stop, cast-iron dome, 3" minimum PVC standpipe under dome, under deck clamp, sump receiver and extension as required. [Jay R. Smith 1070-C-R](#) or approved equal.
 4. Roof drains labeled RD "S" for use at scupper drains shall be [Jay R. Smith Figure 1520T-NB](#) cast iron flush drain with nickel bronze strainer.

5. Unless otherwise noted, acceptable manufacturers shall be Josam, Sioux Chief, J.R. Smith, Mifab, Watts, and Zurn.

2.7 ACCESS PANELS

- A. Group valves together above suspended ceilings, walls, furred spaces to minimize the number of access panels, but with all valves freely accessible for maintenance. Locate all valves within 1'-0" of access point.
- B. Furnish access panels of proper size to service concealed valves and cleanouts. Panels shall be of the proper type for material in which they occur and are to be furnished by the Contractor, but installed by the particular trade for the material within which the access panel is installed.
- C. Panels shall have flush doors with No.14 USCG steel door and trim No. 16 USCG steel frame, metal wings for keying into construction, concealed hinges, and screwdriver operated stainless steel cam lock. Panels shall be shop coated with one coat of zinc chromate primer. Valves above removable ceilings shall have tile clips by the Contractor for identification.
- D. Access panels are not allowed in gypsum ceilings in public spaces.

2.8 INSULATION

- A. The following shall be insulated:
 - 1. All domestic cold water piping above grade except at horizontal chase branch piping to individual plumbing fixtures.
 - 2. All hot water and hot water return piping except at horizontal chase branch piping to individual plumbing fixtures.
 - 3. All horizontal storm drain piping and roof drain bodies.
 - 4. All hot and cold water piping exposed to areas subject to freezing, refer to "Heat Cable for Freeze Protection of Piping" under Part 2 of Section 15400 for additional requirements.
- B. Domestic hot, cold, hot water recirculation, primary storm drainage, and waste drainage piping shall be insulated with 4 lb. density sectional fiberglass insulation with a thermal conductivity not to exceed 0.24 with white all service jacket and vapor barrier. All joints and seams shall be sealed vapor tight. All seams and staples shall then be covered with "All Service Jacket" three-inch wide tape.
- C. All interior horizontal storm drainage piping systems and roof drain bodies are to be insulated with blanket type glass fiber bonded with thermosetting resin with white vinyl vapor retarding facing, 2" wide stapling/taping tab.
- D. Materials as specified in this section shall be manufactured by CertainTeed, Johns Manville, Knauf, Owens Corning or equal. Insulation thicknesses shall be as shown in the following table:

Piping System Types	Minimum Pipe Insulation		Insulation Thickness for Pipe Sizes				
	Fluid Temperature Range		1 in. and Less	1-1/4 to 2 in.	2-1/2 to 4 in.	5 and 6 in.	8 in. and Larger
	°C	°F	In.	In.	In.	In.	In.
PLUMBING							
Domestic Water	Ambient	Ambient	0.5	1.0	1.0	1.0	–
Domestic Hot Water and Hot Water Recirculation	43-71	110-160	1.0	1.0	1.5	1.5	–
Above Grade Drains and Piping Receiving Condensate or Ice Machine Discharge	4.5-15.5	40-60	0.5	1.0	1.0	1.5	–
Horizontal Storm Drainage	Ambient	Ambient	–	–	1.0	1.0	1.0

2.9 HEAT CABLE FOR FREEZE PROTECTION OF PIPING

- A. Provide electric heat tracing on all domestic water piping and sanitary traps exposed to areas subject to freezing.
- B. Provide a complete UL Listed, CSA Certified, or FM Approved system of heating cables, components, and controls to prevent pipes from freezing.
- C. Electric heat cable shall be installed linearly along the bottom of the pipe and allowance shall be made for all fittings, valves, pipe supports, etc. Cable shall be installed prior to insulation of the piping system.
- D. Electric cable shall be capable of maintaining a minimum water temperature of 40 degrees F at an ambient air temperature of 0 degrees F.
- E. The electric cable shall be the self-regulating type that responds to varying localized temperature conditions by varying the heat output along its length. This shall be accomplished by a self-regulating core, which varies its resistance continuously with changes in temperature. A constant wattage heater is unacceptable.
- F. Provide a thermostat control, which de-energizes the heating cable when the ambient air temperature is above 40 degrees F (adjustable). The heat cable shall be entirely self-regulating while energized.
- G. Provide all power connection hardware, splices, end seals, etc., to accomplish installation. All hardware shall be by the same manufacturer as the cable.
- H. Electric heating cable and accessories shall be UL Listed. Electric heating cable shall conform to all requirements of Division 16 - Electrical Requirements.
- I. Electric heating cable shall be [Raychem XL-Trace](#) or approved equal, 8 watts per foot.
- J. All piping shall be insulated with 1" thick fiberglass insulation.
- K. Heating-cable circuit shall be protected by a ground-fault device for equipment protection. This requirement is in accordance with section 427-22 of the NEC-2002.
- L. All heating cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide pipe freeze protection. Component enclosures shall be rated NEMA 4X to prevent water ingress and corrosion. Installation shall not require the installing contractor to cut into the heating-cable core to expose the bus wires. Connection systems that require the installing contractor to strip the bus wires or that use crimps or terminal blocks, shall not be acceptable.

2.10 PIPE SUPPORTS AND HANGERS

- A. All piping shall be supported by means of hanger rods and pipe hangers from roof or floor structure using supplementary steel and/or lagbolts. Water supply pipe connecting to pumps, equipment, fixtures or fixture supplies shall be made rigid at the connection point.
 - 1. Piping shall be supported from (new) (existing) concrete construction with Anvil International Fig. 282 inserts or drilled expansion anchors.
 - 2. Piping shall be supported from new steel construction with Anvil International Fig. 131 beam clamp, Fig. 61 beam clamp, Fig. 66 welded beam attachment or Fig. 60 washer plate with all-thread rod.
 - 3. Piping and brackets shall be supported from hollow block construction using drilled masonry holes and cadmium plated toggle bolts.
 - 4. Piping shall be supported from wood truss construction with plated lag screws or bolts, B-3227 and B-3228.
 - 5. Pipe supports shall not be attached to floor or roof deck.
 - 6. Acceptable manufacturers are: Anvil, B-Line and FNW.
- B. Unless otherwise noted, hangers and clamps shall be as listed below (all model numbers are B-Line Systems):
 - 1. Cast iron/steel pipe - B3100 or B3109.
 - 2. Insulated water pipe - B3100 or B3109 with B3151 placed over insulation protection saddle.

3. Uninsulated bare copper pipe - B3170 CTC plastic coated.
 4. All supports and mounting hardware are to be galvanized, cadmium plated, or factory enamel painted.
 5. All supports on insulated piping systems shall be sized to fit outside the insulation and shall be provided with insulation inserts and shields at each hanger or support point.
- C. Branch piping to fixtures in chases shall be supported with plastic or copper clamp type supports:
1. B-Line Ruffin series.
 2. Holdrite Systems.
- D. Maximum spacing between pipe hangers shall be:
1. Steel pipe
 - a. 1-1/4" and smaller: 6'-0"
 - b. 1-1/2" – 2": 8'-0"
 - c. 2-1/2" and larger: 10'-0"
 2. Cast iron soil pipe: 2" and larger: 10'-0"
 3. Copper tubing:
 - a. 1/2" – 1-1/4": 5'-0"
 - b. 1-1/2" – 2": 8'-0"
 - c. 2-1/2" and larger: 10'-0"
 4. PVC/CPVC and all plastic pipe:
 - a. 1-1/4" and smaller: 3'-0"
 - b. 1-1/2" and larger: 4'-0"
 5. Pex Piping
 - a. 1" and smaller: 18"
 - b. 1¼" inch and larger: 32"
- E. At least one hanger shall occur within 2'-0" from where change in direction takes place. Where pipes extend down or up to other floors, pipe clamps shall be provided on each floor to support vertical risers. Vertical piping drops shall be rigidly anchored to structure at the top and bottom offsets and at eight foot increments along the vertical drop.
- F. Special approved hangers that require less installation space are to be used where required due to ceiling space limitations.
- G. All connections to pumps and other vibrating machinery shall be provided with stainless steel braided flexible hose connections. Connections to potable water systems shall meet ANSI/NSF 61 design standards.

2.11 WATER HEATERS – GAS STORAGE TYPE

- A. Provide gas storage type water heaters as specified on the Drawings.
- B. Water heater shall carry an A.G.A. certification for 150 psi working pressure, an ASME temperature and pressure relief valve (T and P) sized for the heater, vacuum relief valve, immersion thermostat, glass lined tank, temperature gauge on outlet, and manual reset high limit control.
- C. Provide a 3" high concrete housekeeping pad at water heaters, pad is to be 3" larger than the footprint of the heater. Water heaters greater than 10 gallons shall be floor mounted.
- D. Provide a combination ball/relief valve on the domestic water supply sized as indicated on the Drawings, [Watts series LFBRV](#) or approved equal.
- E. Water heaters that are not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment. A check valve and expansion tank can be utilized in lieu of the supply side heat trap.
- F. Gas-fired water heaters shall be as manufactured by:
 1. A.O. Smith
 2. Bradford White
 3. Lochinvar
 4. State

2.12 FLASHING

- A. Vent pipes passing through roof shall be flashed watertight.
- B. The roof connections shall meet the approval of the manufacturer of the roofing materials and shall comply with the roof bond requirements.
- C. All vent piping shall be offset above ceilings or in attic space and as shown on the Drawings to penetrate roofs on the least visible sides of building.

2.13 FLOOR, WALL AND CEILING PLATES

- A. Furnish and install heavy gauge chromium plated steel wall and ceiling plates on all exposed pipes in finished areas where they pass through walls, ceilings, etc. Plates shall be of type that will remain permanently in position and where pipes are insulated they shall be of size necessary to cover insulated pipe.

2.14 GALVANIC PROTECTION

- A. Insulate joints between dissimilar metals with suitable isolation gasket and bolts with fiber ferrules and washers and/or suitable armored insulation fittings by Clearflow, Crane, Capital, or Epco, so there will be no contact between the metals or with insulating bushings.

2.15 PIPING SYSTEMS IDENTIFICATION

- A. A marker showing the service and an arrow indicating the direction of flow shall be applied on all of the following piping systems applicable to the project installed under this section of the Specifications:
 - 1. Acid vent piping
 - 2. Acid waste piping
 - 3. Compressed air piping
 - 4. Domestic hot, cold and hot water recirculation water piping
 - 5. Fuel oil piping
 - 6. Gas piping
 - 7. Primary and emergency storm drainage piping
 - 8. Sanitary, waste and vent piping
 - 9. Softened water piping
 - 10. Steam piping
 - 11. Vacuum piping
- B. Piping identification shall be applied on all piping systems in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each wall and floor penetration (both sides), and at connections to equipment. In addition, straight runs of piping shall be labeled at intervals not greater than 25 feet.
- C. The letter size and background color shall conform to the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W. H. Brady Company, or Westline products.
- D. Each valve in the Plumbing and Fire Protection systems is to be provided with an individually numbered valve tag.
- E. Valve tags are to be brass or plastic laminate, 1-1/2" minimum diameter with brass chain and hook for securing to the valve.
- F. Valve tags will include a "P" or "FP" lettering designation to indicate the appropriate system. Numbering shall be consecutive for each service of either the Plumbing or Fire Protection systems.
- G. A printed list or schematic drawing shall be compiled for each system indicating the location and detailed description of the system or equipment served.
- H. One copy of each list shall be framed and mounted at the location designated by the Building Engineer. An additional copy of each list is to be included in the Operations and Maintenance Manual.

2.16 EQUIPMENT LABELING

- A. All equipment shall be labeled. This shall include all pumps, water heaters, storage tanks, and other similar equipment.
- B. Equipment labeling shall be one of the following, unless noted or specified otherwise.
 - 1. Permanently attached plastic laminate signs with 1" high lettering.
 - 2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All equipment and materials shall be completely installed, adjusted, and fully operational with all accessories and connections.
- B. Equipment, piping, ductwork, etc. shall fit into the spaces provided in the building and shall be installed at such times and in such a manner as to avoid damage and as required by the job progress. The Contractor shall coordinate work with other trades and locate work described herein to avoid interferences with structural, electrical and architectural work. Equipment, accessories and similar items requiring normal servicing or maintenance shall be accessible.
- C. The Engineer reserves the right to direct the removal of any item which, in his opinion, does not present an orderly and reasonably neat or workmanlike appearance. Such removal and replacement shall be done when directed by the Engineer and without additional cost to the Owner.
- D. Mounting heights, unless otherwise noted, are to the finished bottom of the device.
- E. All work shall be designed and installed to comply with the requirements for the seismic design category and use group for the area in which the building is constructed.

3.2 EXCAVATION, TRENCHING AND BACKFILLING

- A. The Contractor shall perform all excavation to install the work herein specified and as indicated on the Drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and others excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling or boring shall be done except under pavement.
- B. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, and tamped in 12" layers. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.
- C. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and tamped until the crown of the pipe is covered by a minimum of 6" of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 95% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting

compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off. A metallic lined underground warning tape shall be provided 12" below finished grade. The tape shall be identified as to the type of line per ANSI standard nomenclature and color.

- D. Provide a layer of sand at least 6" deep under all plastic pipe installed in soil. Bell holes shall be excavated to ensure that the sewer pipe rests for its entire length upon a solid trench bottom.
- E. Perform excavation and backfilling work in accordance with applicable portions of the earthwork section.

3.3 STORAGE AND PROTECTION OF MATERIALS

- A. During construction, all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers, etc.
- B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, test plugs until final connection to system is made.
- C. All equipment and piping shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.
- D. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in manner to prevent damage to materials during storage and handling. Replace damaged materials.
- E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.4 CUTTING AND PATCHING

- A. Work shall include all cutting, patching, masonry and carpentry required as part of the equipment installation when not provided by other sections of these specifications.
- B. All work shall be performed as specified under architectural specification section for cutting and patching.

3.5 CONCRETE WORK

- A. Construct curbs, pads, vaults and similar supports for equipment where required.
- B. Provide 3" thick housekeeping pads at floor mounted equipment a minimum of 3" larger than the entire area occupied by equipment. Dowel pads to structural slab.
- C. Perform concrete work in accordance with applicable portions of Concrete sections. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

3.6 CLEANING

- A. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the job site.
- B. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, etc. shall be thoroughly cleaned both inside and out.
- C. After testing and balancing of systems as specified and just prior to Owner review and acceptance, all systems shall be finally cleaned and shall be left ready for use.

3.7 PAINTING

- A. Painting, except as otherwise specified, will be done under another section of the specifications, but the Contractor shall leave all surfaces of work free of rust, dirt and grease.
- B. The Contractor shall touch-up to match original finish any equipment scratched in shipment or installation. Touch-up painting of plumbing equipment shall be part of the plumbing work.

- C. Provide one coat of rust preventive primer on all new structural steel supports and new ferrous surfaces which are not galvanized (this includes piping systems). Rust preventative painting shall be part of the plumbing work.
- D. All painting and coating shall match the original and shall conform to the requirements detailed in other sections of these specifications. Do not paint over nameplates on equipment, nonferrous hardware, accessories or trim.

3.8 EQUIPMENT SUPPORT

- A. Major equipment supports (framed structural openings, etc.) shall be furnished and installed by others as shown on the Drawings. The plumbing work shall include, the furnishings and installation of all miscellaneous equipment supports, structural members, rods, clamps and hangers required to provide adequate support of all equipment.
- B. Unless otherwise shown on the Drawings, all equipment, piping, and accessories shall be installed level, square, and plumb.
- C. All equipment, piping, etc. supported by structural joists shall be supported by the top chord only of such joists. Hangers shall not be attached to the bottom chord of any joists.

3.9 PIPE PENETRATIONS

- A. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe penetrations. Sleeves for pipe shall be Schedule 40 black steel. Sleeves shall be sized to provide a minimum of 1/4" clearance between the sleeve and pipe.
- B. The 1/4" minimum clearance shall be provided between the sleeve and the insulation on insulated piping systems. A gap of the insulation shall be omitted at each side of a rated wall penetration to allow for the required fire stopping.
- C. As far as possible, all pipe penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.
- D. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, escutcheon plates shall be chrome plated. All escutcheon plates shall be sized to completely conceal the penetration.
- E. Pipe penetrations through exterior walls shall be sealed watertight with expandable link type seals by Thunderline, Linkseal or Engineer approved equal.
- F. All pipe and duct penetrations of fire, smoke, or fire and smoke-rated assemblies shall be fire-stopped as required to retain the integrity of the UL rated assembly. Fire barrier products shall be as manufactured by Tremco, Hilti, 3M, Metacaulk, Nelson, or approved equal.

3.10 FLASHING

- A. All piping penetrating roofs shall be flashed in an approved manner, shall be watertight, and shall conform to the requirements detailed in other sections of these specifications.
- B. Flashing for piping shall be sheet lead of not less than 6 pounds per square foot, shall have a base not less than 2 square feet, and shall extend up over and into the open end of the pipe. All flashing shall be properly caulked and sealed.

3.11 PIPING SYSTEMS

- A. Water Piping - General
 - 1. Pipe used in piping assembly must be clean of dirt and obstructions and shall have ends square and reamed before putting into the fittings.
 - 2. All piping must be true and plumb with proper pitch for draining of the soldering.
 - 3. All domestic water lines serving flush valve fixtures and washing machines shall be protected from water hammer by shock absorbers. Where shock absorbers are required they shall be as manufactured by Josam Mfg. Company, J. R. Smith, Sioux Chief Ind., Precision Plumbing or Zurn Mfg. Co. and shall conform to the Plumbing and Drainage Institute published requirements.

4. All connections to water heaters, tanks and equipment shall be made with unions or flanges. Insulated piping systems shall be installed to provide space for insulation.
 5. Grooved joint shall be installed in accordance with the manufacturer's written recommendations. Grooved ends shall be clean and free from indentations, projections, or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)
 6. When installing Aquatherm Green piping for all Potable and Non Potable systems Contractor shall have received installation training from either the pipe/fitting manufacturer or designated representative before the project starts and shall furnish a copy of the "training documentation" within the project submittal for each installing individual showing current installation training.
 7. When installing CPVC for all Potable and Non Potable systems Contractor shall have received installation training from either the pipe/fitting manufacturer or designated representative before the project starts and shall furnish a copy of the "training documentation" within the project submittal for each installing individual showing current installation training.
 8. When installing Pex piping for all Potable and Non Potable systems Contractor shall have received installation training from either the pipe/fitting manufacturer or designated representative before the project starts and shall furnish a copy of the "training documentation" within the project submittal for each installing individual showing current installation training.
- B. Sanitary Waste, Vent, Indirect Waste and Storm Drain Piping - General
1. Pipes shall be plumb and parallel to building walls, beams and columns unless otherwise indicated. All horizontal lines are to be evenly pitched and properly secured with iron or steel hangers, unless noted otherwise. A pitch of 1/4 inch per lineal foot shall be maintained on all soil, and waste lines, wherever possible. Where long runs of piping require less pitch due to space restrictions, a less pitch shall be allowed on main lines four (4) inches and over in size, but in no event should any pipeline have a slope less than 1/8 inch per foot.
 2. All soil and waste pipes shall be extended out full size through the roof or connected to a common vent as shown on the Drawings.
 3. Main vent stacks shall run parallel to the soil pipe stacks and shall connect to the vent continuation of the soil stack at least three (3) feet above the rim of the highest plumbing fixtures on the stack. Vent stacks shall also be connected at the base or horizontal offset of the soil stack through a Y and 1/8 bend or an upright Y fittings. Offsets in vent pipe shall be made with 45 degree fittings wherever possible. Horizontal vent lines shall pitch toward the waste line.
 4. Threaded joints shall have American National taper screw thread with graphite and oil compound applied to the male threads.
 5. Sanitary and vent stacks are to be run straight and plumb and all offsets shall be made at an angle of not less than 45 degrees.
 6. All existing sanitary and vent systems re-used within the buildings shall be inspected and rodded or pressure flushed to restore the piping to full flow capacity.
- C. Mounting heights, unless otherwise noted, are to the centerline of the equipment and/or device.

3.12 TESTING OF PIPING SYSTEMS

A. General

1. All piping systems shall be subjected, before being insulated or concealed, to testing with water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested required head or pressure shall be maintained until all joints are inspected.
2. All tests shall be witnessed by the inspector having jurisdiction and the Owner's Representative, with a minimum 48-hour notice given these authorities.
3. All equipment, material, labor and testing mediums required for testing any of the various systems or any part thereof shall be furnished by the Contractor.
4. All connected equipment, accessories, etc. shall be isolated from piping systems prior to testing.

B. Sanitary Piping Systems

1. Water test shall be applied to these drainage systems either in their entirety or in sections as required, after rough piping has been installed. If the system is tested in sections, each opening shall be tightly closed except the highest opening in the section under test. All sections shall be tested with a minimum of 10 feet of head. In testing successive sections, at least the upper 10 feet of the next section shall be tested so that no joint of piping in the building shall be submitted to a test of less than 10 feet of head. The water shall be kept in the system for at least 30 minutes before inspection starts; the system shall then be made tight at all points.
2. Any points of the drainage systems to be tested with air instead of water shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets or outlets, forcing air into the system until there is a minimum gauge pressure of 5 psi. This pressure shall be held without the introduction of additional air for a period of at least 30 minutes.
3. Exterior connections shall be tested as part of the interior systems.

C. Interior Water Piping Systems

1. Upon completion of the entire water supply system or a section of it as required, it shall be tested prior to connection of fixtures and proved tight under a water/air pressure of 150 psi. Pressure shall hold for a period of one hour without introducing additional water/air. Water used for testing shall be from a potable source of supply. Defective joints or piping shall be replaced as required and all piping shall be retested.

D. Exterior Water Piping System

1. All exterior domestic water piping shall be tested to 150 psi for a period of two hours.

E. Defective Work

1. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. All repairs to piping shall be made with new material. Caulking of screwed joints or holes is not acceptable.

F. Additional Tests

1. Provide all additional tests such as smoke or pressure tests as required by the regulations or as directed by authorities making the inspection.
2. Provide for any repeated test as directed by the Owner's Representative, to make all systems tight as required.
3. Visual inspections of joints, valves, etc. shall be made as directed by the Engineer.

3.13 DISINFECTION OF WATER SYSTEM – INTERIOR AND EXTERIOR

- A. Prior to project completion, all potable water piping systems shall be disinfected per local code requirements.

- B. Whenever the authority having jurisdiction does not specify disinfection procedures, the new water piping system shall be thoroughly disinfected with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or sodium hydrochloride solution and shall be introduced into the system and drawn to all points in the system. The disinfection solution shall be allowed to remain in the system for a period of eight hours, during which period all valves and faucets shall be opened and closed several times. After disinfection, the solution shall be flushed from the system with clear water until the residual chlorine content is not greater than 0.2 parts per million.
- C. This work is to be supervised or performed by an approved chemical testing laboratory and results sent to Engineer or his representative for verification.

3.14 DOMESTIC HOT WATER SYSTEM BALANCING

- A. The test and balance contractor shall provide testing, adjusting and balancing of the hot water system, once the system is fully installed and operational. Preliminary and final reports shall be prepared and issued to the General Contractor, Architect and Engineer.
- B. Preparation of the hot water system for balancing:
 - 1. Confirm outlet temperature of the system at water heaters and/or storage tanks.
 - 2. Verify recirculation pump operation and rotation.
 - 3. Confirm/adjust setpoint of each individual riser balancing valve to flow a minimum of 0.5 gpm or as otherwise noted on the documents.
- C. The test and balance report shall indicate the following:
 - 1. Pressure, temperature and flow in gpm at the discharge side of each balancing valve referencing the valve tag number.
 - 2. Pressure, temperature and flow in gpm at the suction side of each recirculating pump.
- D. Copies of the final approved balancing report are to be included in the O and M manuals as noted in "Permits" under Part 1 of Section 15400.

3.15 FIXTURE CONNECTIONS AND SUPPORTS

- A. Wall fixtures shall be hung by means of carrier type fixture supports as manufactured by J.R. Smith, Josam, Mifab, Wade or Zurn.

3.16 SLEEVES

- A. Furnish and install pipe sleeves around all piping passing through masonry walls, floors, beams, etc. Sleeves shall be of such diameter as to allow pipe to pass through easily and permit expansion and contraction of pipe. Where pipes are insulated, the sleeves shall be of such diameter as to allow the insulated pipe to pass through easily. The sleeves shall be placed before the pouring of concrete and before construction of walls. Sleeves for vertical risers shall extend a minimum of 1" above the floor slab. Sleeves to outside walls below grade shall be caulked or provided with expansion type mechanical seals as required to make them waterproof.

3.17 INSTALLATION OF UNIONS

- A. Unions shall be located as shown on plans and as required by equipment so piping and equipment can be easily dismantled. Unions shall not be installed in any location where they are not readily accessible.

3.18 TRAPS

- A. All fixtures, drains, etc. shall be provided with traps, unless specifically shown or specified otherwise. Traps shall be set in an upright position, level and true, and shall be vented as shown and required. All exposed traps shall be provided with cleanout plugs.

3.19 CLEANOUT INSTALLATION

- A. Furnish and install cleanouts in soil and waste lines as required by Code and/or job conditions, as shown on the Drawings and as follows: At or near the end of each branch and main drainage line, horizontal lines at intervals as required by code. All cleanouts shall be readily accessible, with plugs easily removable for cleanout lines. Cleanouts at the base of vertical piping shall be held within 2'-0" from finished floor unless otherwise indicated.

3.20 FLASHING INSTALLATION

- A. All pipes passing through roofs shall be flashed in an approved manner. Flashing shall be watertight.
- B. Roof connections shall meet the approval of the manufacturer of roofing material and shall comply with roof bond requirements.
- C. The Contractor is to inspect all existing plumbing system roof penetrations and repair/replace flashing as required to provide a watertight installation.

3.21 EQUIPMENT AND MATERIAL PROTECTION

- A. During construction all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers.
- B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, test plugs until connection to system is made.

3.22 SPACE REQUIREMENTS

- A. Piping, apparatus and equipment shall fit into the space provided in the building or within the property and shall be installed at such time and in such manner as to avoid damage to the building structure or property as required by the job progress. Equipment, apparatus and accessories requiring normal servicing or maintenance shall be made easily accessible.

END OF SECTION

SECTION 15401

NATURAL GAS PIPING SYSTEM

PART 1 GENERAL

1.1 SYSTEM

- A. Provide a complete system of natural gas piping from gas meter to all natural gas burning equipment and appliances.
- B. All gas equipment specified herein shall be suitable for use with natural gas system.

1.2 DESIGN STANDARDS

- A. The natural gas system shall be designed and installed in accordance with the requirements of the following codes and standards:
 - 1. The International Fuel Gas Code, 2012 Edition, with most current State of West Virginia Amendments
 - 2. NFPA 54 - National Fuel Gas Code

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. Underground Piping
 - 1. Schedule 40 black steel pipe, ASTM A53 with polyethylene jacket, welded joints and standard weight black steel butt weld or socket weld fittings, ASTM A243.
 - 2. Polyethylene pipe, ASTM 2513, with heat fusion joints and fittings, ASTM D2513.
- B. Aboveground Piping
 - 1. Schedule 40 black steel pipe, ASTM A53 with welded joints and standard weight black steel butt weld fittings, ASTM A234 or socket weld fittings, ASTM A105.
 - 2. Schedule 40 black steel pipe, ASTM A53, with 150 pound steel slip-on welding flanges, ASTM A181, for connection to flanged valves and equipment.
 - 3. Schedule 40 black steel pipe, ASTM A53, with screwed joints and 150 pound threaded malleable iron fittings, ASME B.16.3.
 - 4. Corrugated stainless steel tubing (CSST) with energy dissipating polyethylene jacket conforming to ASTM-A240; brass flare type fittings, ASTM B16, 5 psi maximum system pressure. Polyethylene jacket shall not exceed 25/50 flame/smoke spread rating. [Tracpipe Counterstrike CSST](#) system only.
 - 5. Copper tubing as permitted by Gas Code and local authorities.

2.2 JOINTS

- A. Threaded joints shall be made with a pipe compound specifically listed as resistant to reaction with liquefied petroleum gas and shall be applied to male threads only. After cutting and prior to threading, pipe shall be reamed and shall have burrs removed.
- B. Welded joints shall be fusion welded in accordance with the American Standards Code for pressure pipe, ASME B31.1, Section 6.
- C. Flanged joints shall be faced true, provided with ring type gasket, and made square and tight. Flanges shall have raised or flat faces to mate with adjacent flanges of valves.

2.3 UNIONS

- A. Unions in steel piping shall be 150 pound socket welded carbon steel conforming to ASME B.16.11 or class 150 malleable iron threaded fittings conforming to ASME B.16.3.

2.4 VALVES

- A. Valves 3" in size and larger shall be semi-steel plug valves with cast iron body, lubricated cast iron plug, flanged ends, and wrench operated for 175 pound WOG. Valve shall be [Rockwell Nordstrom Fig. 143](#) or equal.
- B. Valves 2-1/2" in size and smaller shall have bronze body and plug, socket welded ends, and square head for 125 WOG. Valve shall be Crane or Fig. 250 or equal.
- C. Full port ball valves 2" in size and smaller shall have brass body with chrome plated brass ball with threaded or socket welded ends, 600 psi WOG, FM approval, AGA approval. Valve shall be [Watts series FBV-3](#) or equal.
- D. Lubricated plug valves shall be lubricated at the factory and sealant shall be suitable for natural gas. Provide two valve wrenches for each type of valve specified.
- E. Acceptable valve manufacturers are Rockwell Nordstrom, Crane, FNW, Stockham, Powell, Walworth, or Milwaukee.

2.5 PRESSURE REGULATING VALVES

- A. Pressure regulator shall be cast iron, ductile iron or stainless steel, corrosion-resistant spring-loaded type with internal pressure relief, 175 psi working pressure. Provide threaded ends for piping 2" and smaller, flanged ends for piping 2-1/2" and larger. All regulator vents shall be extended to the exterior unless otherwise specified. Regulators equipped with and labeled for use with an approved vent-limiting device shall not require a vent to the exterior. Acceptable manufacturers are Fischer Regulators, Jordan Valve, Maxitrol, Rockwell and Sensus.
- B. Low pressure regulators supplied from medium and high pressure gas systems shall be lock-up type high gas pressure regulators and shall be installed a minimum of ten feet upstream of the equipment inlet connection.
- C. Where low pressure line regulators have inlet pressures exceeding 2 psi, a downstream over-pressure protection device (OPD) shall be installed in accordance with ANSI Z21.80.
- D. Medium pressure regulators shall have a capped tee fitting (sediment trap) upstream from the regulator and a capped tee fitting installed not less than 10 pipe diameters downstream of the regulator.

2.6 PROTECTIVE COATING

- A. Underground steel service entry piping shall be furnished with factory applied plastic coating and field coating at joints conforming to AWWA Standard C-203. All valves, fittings, and joints in underground piping shall be field coated using a heat-applied coal tar enamel tape, using two coats of heavy mastic, using "Scotchwrap," "CT Tapecoat" or "X-Tru-Tape." Field coating shall extend over mill wrapping a minimum of 4 inches. Damaged coating shall be repaired as specified for valves, fittings, and joints.

2.7 CATHODIC PROTECTION

- A. All underground gas piping shall be cathodically protected. Provide a minimum of two 17-pound magnesium anodes containing 6% aluminum and 3% zinc alloy. Anodes shall be distributed equally along the pipe run, but spacing shall not exceed 100 feet between anodes. Each anode shall be attached to the pipe by the Caldwell or brazing process. The connecting wire shall be buried in backfill composed of 75% gypsum, 20% bentonite and 5% sodium sulphate. Wherever the underground gas piping rises above grade, provide an insulating dielectric fitting.

2.8 FIRE PLACE LOG LIGHTER

- A. Cast iron burner bar, 10" long with 1/2" IPS threaded inlet, chrome plated three way loose key gas valve. [Prier model number C-69](#) / C-64.

2.9 PIPE SUPPORTS & HANGERS

- A. All piping shall be supported by means of hanger rods and pipe hangers from roof or floor construction using supplementary steel and/or lagbolts.

1. Piping shall be supported from concrete construction with [Anvil International Fig. 282](#) inserts.
 2. Piping shall be supported from new steel construction with Anvil International Fig. 131 beam clamp, Fig. 61 beam clamp, Fig. 66 welded beam attachment or Fig. 60 washer plate with all-thread rod.
 3. Piping and brackets shall be supported from hollow block construction using masonry drilled holes and toggle bolts.
 4. Piping shall be supported from wood truss construction with plated lag screws or bolts, [B-3227](#) and B-3228.
- B. Unless otherwise noted, hangers and clamps shall be as listed below (all model numbers noted are B-Line Systems):
1. Gas pipe – [B3100](#) or B3109.
 2. All supports and mounting hardware are to be galvanized or cadmium plated.
- C. Maximum spacing between pipe hangers shall be:
1. 1/2": 6'-0"
 2. 3/4"-1": 8'-0"
 3. 1-1/4" and larger: 10'-0"
- D. At least one hanger shall occur within two feet (2'-0") from where a change in direction takes place in the line. Where pipes extend down or up to other floors, pipe clamps shall be provided on each floor to support pipe. Equal manufacturers for hangers and clamps are B-Line Systems, Anvil International, Fee and Mason, PHD Manufacturing, or approved equal.
- E. Piping on roofs shall be supported every six feet on piping 1/2" size, eight feet on piping 3/4" – 1" size, and ten feet on piping 1-1/4" and larger, and at each change in direction, with manufactured adjustable height stainless steel pipe stands with integral pipe roller guides or clevis hanger for securing horizontal piping. Pipe stands shall be secured to the roof per the roofing manufacturer's installation requirements. Pipe stands shall be [Miro Industries Model 4-RAH](#) Series or [ERICO CADDY Series](#).
- F. Pipe supports for rooftop gas piping may be painted fabricated steel pipe stands with integral pipe guides if approved by the roofing manufacturer.
- 2.10 EMERGENCY SOLENOID VALVE
- A. The main gas supply to kitchen equipment shall be provided with an automatic solenoid valve with manual reset lever. The valve shall be interconnected with the hood fire suppression system to shut down gas supply to all kitchen equipment.
 - B. The valve shall be energized to open, closed when de-energized with manual reset. The required voltage shall be coordinated with the electrical contractor. The valve shall carry a UL Listing.
 - C. The emergency shutoff valve is to be provided with manual shutoff valves and unions on each side and located in a surface mount steel cabinet with flush solid metal door. The cabinet is to be located as shown on the drawings with the top of cabinet flush with finished ceiling. The cabinet shall be [Potter Roemer 1810 series](#) or approved equal.
 - D. Valves 3/4"-2-1/2" in size shall be [ASCO 8044 series](#).

PART 3 EXECUTION

3.1 INSTALLATION

- A. All interior gas systems shall be bonded to the building's grounding system per the requirements of NEC Section 250. A written statement bearing the names and signatures of the plumbing and electrical contractors indicating compliance with the NEC grounding requirements is to be submitted prior to project close-out.
- B. A valved union shall be provided at each connection to a piece of equipment. Equipment provided with a flanged inlet shall have a flanged connection.
- C. All valves installed in horizontal lines shall be installed with the stems horizontal or above.

- D. All gas piping shall be graded at the maximum slope available to prevent traps. All horizontal lines shall slope to risers and from the risers to the meter or appliance.
- E. Drip legs, 6" long, shall be provided in gas piping at ends of horizontal runs, at the base of risers, and at connections to equipment.
- F. Provide pressure regulators at all required connections to equipment; regulators shall be provided at the pressure required by the equipment served. Extend all pressure regulator vents individually to the exterior per local code authority requirements.
- G. Branch piping shall be taken off the top or sides of horizontal lines, but not from the bottom.
- H. Changes in pipe size shall be made with reducing fittings. No bushings will be allowed.
- I. No gas piping shall be placed underground inside the building.
- J. All interior and exterior ferrous metal gas piping, fittings and supports shall be primed and painted with two (2) coats of exterior grade enamel paint unless galvanized, stainless steel, or coated CSST piping is used. The paint color shall be submitted to the Architect for approval.
- K. All gas supply connections to food service equipment are to be provided with an AGA rated flexible connector with quick disconnect coupling. The flexible connector shall be 5'-0" minimum length or longer as required to allow for removal of the food service equipment item.
- L. Underground Piping
 - 1. General:
 - a. Lay, align, anchor and test pipe and make-up joints. Perform excavating, cleaning, laying, jointing and backfilling as concurrently as possible to maintain uniform installation. Replace or repair damaged materials to condition equal to new material.
 - 2. Excavation and Backfilling:
 - a. Care shall be taken not to excavate below depth necessary.
 - b. Do not leave unjointed piping in trench overnight. Backfill trenches by filling and tamping in not more than 6" layers after pipes, tanks, or other structures have been installed, tested and approved.
 - 3. Pipe Crossing:
 - a. Lay lower pipe, backfill with crushed stone, gravel or concrete as directed and thoroughly compact to level of upper pipe.

3.2 TESTING

- A. All piping is to be inspected and purged per the requirements of NFPA 54 and the local authorities' requirements.
- B. The entire gas piping system shall be tested with compressed air to 100 psi for a period of two (2) hours.
- C. Defective joints or piping shall be replaced as required and the system shall then be re-tested.

END OF SECTION

SECTION 15450

PLUMBING FIXTURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15400 - Plumbing General.

1.2 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install the plumbing fixtures, trim and supports, complete as indicated on the Drawings and as specified herein.

PART 2 PRODUCTS

2.1 GENERAL

- A. All fixtures shall be white, unless otherwise indicated.
- B. All water closets shall have fully glazed trapways.
- C. All exposed trim to be heavy polished chrome plated brass, unless otherwise indicated. Chrome plated escutcheons are to be provided on all exposed fixture and food service equipment supplies and waste lines.
- D. Electric water coolers shall be ARI Certified and shall carry a UL Listing. Units shall use refrigerant which is approved for use without ozone depleting properties. All waterway components are to be certified as lead free.
- E. All sinks and lavatories for use by the disabled shall have manufactured insulation shields on all supplies and P-traps per ADA requirements unless the vanities are provided with ADA compliant shrouds.
- F. All exposed plumbing fixture items such as faucets and flush valves shall be provided with vandalproof trim.

2.2 CLEANOUTS

- A. Cleanouts on exposed piping in unfinished areas shall be heavy duty cast iron with countersunk plug. Cleanouts shall be Jay R. Smith Figure 4220 or approved equal.
- B. Cleanouts installed behind walls in finished areas shall be cast iron ferrule type for no-hub or service weight pipe with nickel bronze round frame and cover with securing screws. Cleanouts shall be Jay R. Smith Figure 4472T or approved equal.
- C. Cleanouts installed in concrete floors shall be cast iron type with gasket seal ABS plug round adjustable ductile iron cover with securing screw and Speedi-Set outlet connection. Cleanouts shall be Jay R. Smith Figure 4231L-M or approved equal.
- D. Cleanouts installed in tile floors shall be cast iron type with gasket seal ABS plug for easy removal, adjustable round nickel bronze top recessed for tile with securing screw and Speedi-Set outlet connection. Cleanouts shall be Jay R. Smith Figure 4151L or approved equal.

- E. Cleanouts installed in carpeted areas shall be cast iron type with gasket seal ABS plug, nickel bronze round frame and cover with carpet marker. Cleanouts shall be Jay R. Smith 4031-Y or approved equal.

2.3 PLUMBING FIXTURES

- A. The following is a list of acceptable manufacturers for the project:
 - 1. Fixtures: American Standard, Kohler, Toto
 - 2. Faucets: American Standard, Chicago Faucets, Kohler, Moen, Speakman, Symmons and Zurn
 - 3. Stainless Steel Sinks: Elkay, Just, Kohler
 - 4. Trim: American Standard, Brasscraft, Kohler, McGuire and Zurn
 - 5. Drains, Carriers and Hydrants: Josam, Mifab, Prier, Jay R. Smith, Wade and Zurn
- B. Plumbing fixtures shall be as scheduled on drawings:

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All wall hung fixtures shall be supported on concealed chair carriers furnished complete with all necessary bolts, nuts, washers and gaskets unless noted otherwise. The adjustable nipple between the cast iron fitting and the closet bowl shall be threaded cast iron. Secure all floor pieces to floor slab.
- B. All exposed piping in connection with fixtures shall be chromium plated. Where supply and waste lines pass through walls, provide chromium plated escutcheons and firmly secure in place.
- C. Provide straight or angle supply valves on inlet supplies to all fixtures.
- D. Fixtures, trim and methods of piping and installation shall conform to local plumbing code. All fixture types shall be the product of one manufacturer. All fixtures shall be white unless otherwise noted.
- E. Bathtub waste and overflow fittings shall be provided with soldered metal connections or PVC solvent welded connections if required by code authorities to eliminate the requirement for access to the fitting.
- F. Fixtures shall be cleaned, adjusted and left in proper working order before the project is turned over to the Owner. Flush and clean all faucet aerators prior to turn over. Adjust all faucet lever handles to be parallel to adjacent rear wall in the off position.
- G. The Contractor shall furnish and install protective guards as required to protect fixtures against damage by normal operations of other trades. Bathtubs shall be provided with tub liners at all times during construction.
- H. Caulk all floor and counter top mounted fixtures and behind all wall-hung plumbing fixtures with white, non-shrinking, silicone caulking eliminating all voids and cracks.
- I. Coordinate the mounting height of all fixtures with the Architect prior to installation.
- J. The Contractor shall obtain exact information relative to finish grade of the top of the floor drains. All floor drains shall be set flush with finished floors.
- K. Cleanouts shall be provided where indicated on drawings and elsewhere as required by code.
- L. Where test tees are installed at the base of the stack or on the stack, they may be used as a cleanout.
- M. Provide the Owner with three (3) wrenches for removing flush cleanout plugs.

END OF SECTION

SECTION 15500

FIRE PROTECTION GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work described in these Specifications and/or indicated on the Drawings shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all systems. All work shall be accomplished by workmen skilled in the various trades involved.
- C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the Architect shall be notified of the discrepancy.
- D. All work performed under this specification shall be accomplished in accordance with the requirements and provisions of the following sections:
 - 1. Section 01600 Sustainable Design Requirements
 - 2. Section 01700 Facility Environmental Requirements
 - 3. Section 01734 Indoor Air Quality Requirements
 - 4. Section 01810 Commissioning
 - 5. Section 15400 - Plumbing General
 - 6. Section 15000 - HVAC General
 - 7. Section 16000 - Electrical General

1.2 SYSTEMS

- A. Systems to be provided under the Fire Protection design section shall be as listed below. The connection point to the site utility service for the fire protection system shall be at 5'-0" from the exterior of the building unless specifically otherwise noted.
 - 1. Automatic Sprinkler Systems
 - 2. Combination Standpipe/Automatic Sprinkler Risers
 - 3. Automatic Dry Sprinkler Systems
 - 4. Pre-action Sprinkler Systems
 - 5. Fire Department Valve Cabinets
 - 6. Painting of exposed piping
 - 7. ESFR Sprinkler Systems

1.3 QUALIFICATION OF CONTRACTORS

- A. The Contractor for the fire protection installation shall be a certified fire protection contractor, licensed for the installation of automatic fire sprinkler systems and other fire protection equipment.

1.4 DESIGN STANDARDS

- A. Fire Protection systems shall be designed and installed in accordance with the requirements of the following codes, standards and design guides:
 - 1. The BOCA National Fire Prevention Code, 1987 Edition, with most current City of Bridgeport, West Virginia Amendments.
 - 1. The International Building Code, 2009 Edition, with most current State of West Virginia Amendments

2. National Fire Protection Association (NFPA) Standards:
 - a. NFPA 101 - Life Safety Code
 - b. NFPA 13 - Installation of Sprinkler Systems
 - c. NFPA 13D - Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes
 - d. NFPA 13R - Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height
 - e. NFPA 14 - Installation of Standpipe and Hose Systems
 - f. NFPA 20 - Installation of Centrifugal Fire Pumps
 - g. NFPA 24 - Installation of Private Fire Service Mains
 - h. NFPA 25 - Inspection, Testing, and Maintenance of Water-based Fire Protection Systems
3. Factory Mutual (FM) Approval Guide
4. Underwriters Laboratories Inc. (UL)
5. Owner's Insurance Underwriter Required.

B. Design Criteria

1. Upon award of the Contract, a new flow test from the two (2) hydrants nearest the site service entry is to be performed by the Contractor to confirm the flow and pressure characteristics of the existing water service. The completed flow test data along with a utility service map of the area is to be forwarded to the Engineer for confirmation of the existing water service.
2. The entire facility will be protected by an automatic sprinkler system supplied by combination fire standpipe/automatic sprinkler systems located within the building stairwells.
3. Automatic sprinkler systems shall be designed to the available domestic water pressure available and shall be hydraulically calculated for the following design standards:
 - a. NFPA 13 Systems

Area/Usage	Hazard Classification	Density GPM/Sq. Ft.	Remote Area	Maximum Head Spacing	Interior Hose Stream
Public Spaces, Lobbies, Corridors, Offices, Restaurants, Lounges, Meeting Rooms	Light	.15	2,000 sq. ft.	225 sq. ft.	250 gpm
Mechanical Rooms, Electrical Rooms, Elevator Equipment Rooms, Maintenance / Storage Rooms, Kitchen / Food Service Areas and Laundry	Ordinary Group 1	.15	1,500 sq. ft.	130 sq. ft.	250 gpm
Ballrooms, exterior loading docks (see NFPA 13-A5.3.2)	Ordinary Group 2	.20	1,500 sq. ft.	130 sq. ft.	250 gpm
Dry Pipe Systems: Parking Garages, Non-heated Attic Spaces, Ceiling Spaces, Porte Cochere and other spaces containing sprinkler piping that do not have alternate provisions to guarantee a 40° F	Ordinary Group 1	.15	1,950 sq. ft.	130 sq. ft.	250 gpm

temperature.					
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- b. NFPA 13D Systems:
 - 1) Sprinklers that are not listed with specific discharge criteria shall provide a discharge of not less than 13 gpm (49 L/min) per sprinkler simultaneously to all of the design sprinklers. The system shall provide a discharge of not less than 18 gpm (68 L/min) to any one sprinkler in the system.
 - 2) Sprinklers that are listed with specific discharge criteria shall provide at least the flow required for the multiple and single sprinkler operating criteria specified by the sprinkler listing.
 - a) The system shall provide at least the flow required to produce a minimum discharge density of 0.05 gpm/sq. ft. (2.04 mm/min) to the design sprinklers.
 - 3) The number of design sprinklers under flat, smooth, horizontal ceilings shall include all sprinklers within a compartment that requires the greatest hydraulic demand, up to a maximum of two sprinklers.
- c. NFPA 13R Systems:
 - 1) Residential Sprinklers
 - a) The system shall provide at least the flow required for the multiple and single sprinkler operating criteria specified by the sprinkler listing.
 - b) The system shall provide at least the flow required to produce a minimum discharge density of 0.05 gpm/sq. ft. (2.04 mm/min) to the design sprinklers.
 - c) Number of Design Sprinklers. The number of design sprinklers under flat, smooth, horizontal ceilings shall include all sprinklers within a compartment that requires the greatest hydraulic demand, up to a maximum of four adjacent sprinklers.
- 4. The fire protection systems shall not be designed to operate if the residual pressure of the existing water service falls to 20 psi or lower at design flow requirements.
- 5. The fire protection system design shall include a minimum of 10 psi safety factor to allow for future losses in the water service pressure characteristics.
- 6. The maximum allowable system velocities shall not exceed 20 fps unless alternate criteria are required by the Owner's Insurance Underwriter.
- 7. Combined standpipe/sprinkler risers or Class I standpipe risers with fire department valves shall be installed in each stairwell within the facility. Automatic sprinkler connections will be supplied from combined standpipe/sprinkler risers with a floor control valve assembly, including check valve, at the required locations. Additional standpipes with 2-1/2" fire department valves are to be provided at required locations throughout the facility per the requirements of NFPA 14.
- 8. Temporary standpipes must be provided during construction and installed before progress of construction exceeds 40 feet in height, as required by section 1413 of the IFC.
- 9. A two-outlet roof manifold complete with fire department valves, caps and chains, automatic ball drip, and isolation valve in a heated space shall be provided for each standpipe and located on the roof, at the roof area adjacent to the roof access point, or at the highest landing of stairwells with stair access to the roof.

10. The fire protection system shall provide 100 psi at the most remote fire department connection; 65 psi may be allowed as a deductive alternate where acceptable to the local authorities and all applicable Owner design criteria.
 11. Standpipes and/or sprinkler connections that are equipped with pressure regulating valves shall be provided with 3" drain risers.
- C. Fire Protection System Alarms
1. The fire protection contractor shall coordinate location and function of all flow, air pressure, supervisory switches, and other dry contacts with the fire alarm contractor.
 2. All control valves in the fire protection system shall be provided with supervisory switches wired for annunciation at the main FACP.
 3. Automatic sprinkler system connections shall be provided with flow switches adjacent to the zone control valve wired for annunciation at the main FACP.
 4. Upright automatic sprinklers will be provided in all elevator shafts and elevator machine rooms. The service to each of these spaces shall be provided with an individual control valve with a supervisory switch and a flow switch located in an adjacent room and wired for annunciation at the main Fire Alarm Control Panel (FACP).

1.5 RENOVATIONS AND ADDITIONS

- A. Prior to the ordering or purchasing of any fire protection equipment or materials or the layout or installation of any work, the Contractor shall examine the premises and verify any and all of the existing conditions under which he will be required to operate, or that will in any manner affect the work under this Contract.
- B. Active Services: When encountered in work, protect, brace, and support existing active fire protection services as required for proper execution of the work. If existing active services are encountered that require relocation, relocate as shown on the Contract Documents or as necessary. Do not prevent or disturb operation of active services that are to remain.
- C. Interruption of Services: Where work makes temporary shutdown of services unavoidable, shut down at night or at such times as approved by Owner, which will cause the least interference with scheduled operations. Arrange work to assure that services will be shut down only during time actually required to make the connection to the existing work.
- D. The existing system installations removed or damaged shall become the property of the Contractor and shall be removed from the project site. Existing ductwork, pipe insulation, equipment or material damaged by the Contractor while performing any work shall be replaced with new materials to match existing conditions.
- E. Where work under this project requires extension, relocation, reconnection or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original and operating condition.
- F. All pipe, fittings, sprinklers, supports, etc. removed in the renovation area are to be removed from the site. No existing pipe, sprinklers or materials are to be removed and reused on the renovation. When a sprinkler has been removed it is to be replaced with only a new sprinkler.
- G. Remove all existing sprinklers and branch piping as required in areas scheduled for replacement of ceilings.
- H. The addition to the existing sprinkler systems shall be designed to the existing available water supply pressure. The Contractor shall confirm the revised sprinkler piping arrangement with hydraulic calculations.
- I. Contractor is responsible for maintaining all fire rated partitions.

1.6 ORDINANCES, PERMITS AND DRAWING APPROVALS

- A. The Contractor shall file all requisite plans relating to this section of the specifications with the proper authorities, secure all permits and approvals and pay all resultant fees for work done under this section.
- B. All fire protection work shall comply with all laws, ordinances, rules, regulations and standards of the City, County, State and the Owner's Insurance Underwriter; all applicable sections of the National Fire Codes and the Codes and Standards of the National Fire Protection Association.
- C. If code or other requirements exceed the provisions shown on the Contract Documents, the Architect shall be notified in writing. Where requirements of the Contract Documents exceed Code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.7 EQUIPMENT, MATERIALS, BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the Drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in the Specifications or on the Drawings as "base" products.
- C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be substantially equal in size, weight, construction quality and capacities. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question.
- D. The Contractor shall coordinate the installation of all fire protection equipment proposed for use in this project with all building trades (architectural, structural and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at no additional cost.

1.8 EXAMINATION OF EXISTING PREMISES

- A. Prior to the ordering or purchasing of any equipment or materials or the layout or installation of any work, the Contractor shall examine the premises and verify any and all of the existing conditions under which he will be obliged to operate, or that will in any manner affect the work under this Contract. No allowance will be made subsequently in this connection in behalf of the Contractor.

1.9 PAINTING

- A. All piping exposed to public sight such as standpipe and drain piping in stairwells, or exposed to exterior or moisture conditions such as piping in parking decks, shall be primed and painted with two coats of an enamel-based paint. The color shall be as directed by the Architect.
- B. Contractor shall touch-up to match original finish any equipment scratched in shipment or installation.

1.10 TRANSPORTATION, DELIVERY, STORAGE AND PROTECTION

- A. The Contractor shall provide and pay for all transportation, delivery, and storage required for all equipment and materials. Upon receipt of all equipment and materials, they shall be properly stored in their original shipping container to protect them from vandalism, theft, the elements, and other harm or damage. Any equipment or materials received in a damaged condition, or damaged after receipt, shall not be installed. Only new undamaged equipment in first-class operating condition shall be installed.

- B. All equipment and piping shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.
- C. The Contractor shall closely coordinate the ordering and delivery of all mechanical equipment with other trades to assure that equipment will be delivered in time to be installed in the building without requiring special or temporary access or building modifications. Certain equipment may have to be installed prior to the erection of the building walls or roofs.

1.11 GUARANTY

- A. All fire protection work described in the Contract Documents shall be guaranteed for a period of one (1) year from the date of final acceptance. This guaranty shall apply to all equipment, materials and workmanship. During the guaranty period, all defects shall be corrected in an acceptable manner, consistent with the quality of materials and workmanship of original construction, at no expense to the Owner.

1.12 SHOP DRAWINGS

- A. It is the responsibility of the Contractor to coordinate the design with the work of all other disciplines so as to avoid conflicts. Where necessary piping shall be offset around ducts, structural members or other obstructions, while maintaining effective coverage, drains shall be provided per NFPA requirements.
- B. Review of the Drawings and hydraulic calculations by Jordan & Skala Engineers, Inc. (JSE) is for coordination with the design concept for the project, and for assurance that they have been prepared in a timely manner. JSE is entitled to rely on the technical sufficiency and timely delivery of these documents, as well as on the computations performed by the subcontractor. JSE shall not be required to review or verify those computations or designs for compliance with applicable laws, statutes, ordinances, building codes, and rules and regulations.
- C. All required submittal data other than fire protection shop drawings shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review unless previously agreed to by the Engineer.
- D. All fire protection drawing submittals shall be at 1/8" scale as a minimum. All submittals shall be in printed bond format only; submittals of multiple prints will be returned without review. JSE will return the original review markup with one (1) scan copy for the Architect; the Contractor is to reproduce the required number of copies and transmit to other parties as required.
- E. The Contractor shall provide an itemized listing which indicates the horsepower and voltage of each piece of equipment that requires electrical service. The itemized list is to be located at the front of the bound submittal and is to be signed by the project managers of the Contractor, Electrical Contractor and General Contractor to ensure coordination of the electrical requirements for the project. Review of the equipment submittal will not begin until the electrical coordination document is provided.
- F. Fire Protection shop drawings shall include all data required by NFPA Section 13. Shop drawing plans shall indicate all lights, grilles, soffits, alarms, speakers and other ceiling components, as well as hydraulic node points, to ensure coordination. Substitutions or alterations to the design included in the Contract Documents shall be clearly stated on the shop drawing submittal. The Contractor shall submit shop drawings to and secure approval of the Owner's Underwriter, local authority and/or state authorities prior to submission to the Engineer. The Contractor shall not commence work, purchase, or provide any materials to the job site without obtaining shop drawing approval. Shop drawings shall include copies of all hydraulic calculations providing design densities, where applicable. In addition, shop drawings submittals shall include printed catalog specifications and data sheets for all of the following as applicable:
 - 1. Fire pump and controller
 - 2. Jockey pump and controller

3. Fire department valves
 4. Sprinkler heads and accessories
 5. Siamese Fire Department connection
 6. Fire valve cabinets
 7. Test header
 8. Roof manifold
 9. Backflow preventer
 10. Cutting oil indicating compatibility with the CPVC sprinkler piping
- G. A letter signed by an officer of the Contractor's company shall be included in the submittal book that states the following items meet or exceed the requirements of the specifications:
1. Pipe and fittings
 2. Valves
 3. Pipe supports
 4. Pipe accessories
 5. Pipe labels and valve tags
 6. Flow switches
 7. Tamper switches
- H. All design drawings and calculations prepared by the Contractor shall bear the seal of a registered professional or fire protection engineer or NICET Level IV certification licensed in the state of the project or equivalent fire sprinkler contractor's certificate seal.
- I. Included with submittals of plumbing equipment requiring electrical connections shall be a written statement confirming coordination of voltage requirements, bearing the names and signatures of the plumbing and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the electrical drawings, as well as with the electrical contractor.

Fire Protection Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

Electrical Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

- J. Provide Material Safety Data Sheet (MSDS) or letter from manufacturer certifying the VOC content for each adhesive, sealant, paint and coating.
- K. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01600 Sustainable Design Requirements.

1.13 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a record set of drawings indicating all changes in the work from that shown in the Contract Documents. Prior to final acceptance by the Owner, the Contractor shall assemble the complete set of as-built drawings that accurately reflects all changes to indicate actual final construction. All concealed piping shall be dimensionally located from at least two (2) column lines or major building structure elements. Drawings shall be a minimum of 1/8" scale.

- B. The original set of "as-built" drawings shall be scanned and transmitted to the Architect in CD format along with the original "as-built" documents.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Prior to final acceptance by the Owner, the Contractor shall provide three (3) copies of an Operations and Maintenance Manual, Bound, indexed, and titled in three-ring, loose-leaf binders. These manuals shall each contain the following:
 - 1. Clear and concise instructions for operation, maintenance, adjustment, lubrication, wiring diagrams and trouble-shooting data for all mechanical equipment. This information shall be prepared by the manufacturer for particular size and model of equipment furnished.
 - 2. Parts list of all parts for equipment, with catalog numbers and other data necessary for ordering of replacement parts.
 - 3. Provide a competent manufacturer's service engineer for a minimum of two (2) days to instruct the operating personnel including the interpretation of all equipment diagrams. A diary of the training sessions shall be made by the instructing manufacturer's service engineer and witnessed by the Owner's representative and shall be included in the as-built submittal.
 - 4. Copies of all approved equipment shop drawings, sprinkler layout drawings, hydraulic calculations and as-built plans shall be submitted with the Operation and Maintenance manual.
 - 5. Index shall include type of equipment, manufacturer, and local representative with address and phone number.

PART 2 PRODUCTS

2.1 FIRE PROTECTION SYSTEM MATERIALS

- A. All materials, pipe, valves and equipment furnished under this section shall be new and approved by NFPA, Underwriters Laboratories Inc. (UL), Factory Mutual (FM) and American Water Works Association (AWWA) where applicable.
- B. The proposal submitted shall include all materials and equipment as specified or shown on the Drawings. Proposed substitutions with difference in price, if any, shall be listed separately on the bid form at the time of submittal.
- C. Required materials not covered by the detailed specifications shall be of a suitable class, grade and type and shall be subject to the approval of the Engineer. Where two or more units of the same class or type of equipment are required, these units shall be the products of a single manufacturer.

2.2 PIPE, JOINTS AND FITTINGS

- A. Underground Piping
 - 1. Class 50 and 51 ductile iron pipe, bituminous coated outside, cement lined interior, ANSI A21.51 and A21.4
 - a. Push-on or mechanical joints with neoprene gasket, 250 psi rating, ANSI A21.11
 - b. Ductile iron mechanical joint fittings with neoprene gasket, bituminous coated outside, cement lined interior, 250 psi rating, ANSI A21.10
 - c. Ductile iron flanged joints for all piping in vaults, red rubber gaskets, 250 psi rating, ANSI A21.15. Cadmium plated heavy hex machine bolts and nuts with bituminous coating field applied.
 - 2. Class 150 polyvinyl chloride (PVC) DR 18 pressure pipe, NSF and Factory Mutual approved, AWWA C900
 - a. Push-on or mechanical joints with neoprene gasket, ASTM D3139 and ANSI A21.11
 - b. Ductile iron mechanical joint fittings with neoprene gasket, bituminous coated outside, cement lined interior, 250 psi rating, ANSI A21.10

- c. Ductile iron flanged joints for all piping in vaults, red rubber gaskets, 250 psi rating, ANSI A21.15. Cadmium plated heavy hex machine bolts and nuts with bituminous coating field applied.
 - 3. Underground piping and installation shall be in accordance with the Insurance Underwriter's requirements and NFPA-24 and shall be installed with a minimum of 2'-6" of cover.
 - a. Trenching conditions for ductile iron pipe shall be Type 1 laying condition, ANSI A21.50.
 - b. Trenching conditions for PVC pipe shall be Class C bedding, ASCE Manual #37, and manufacturer's recommendations.
- B. Aboveground Piping
 - 1. Schedule 40 welded or seamless steel pipe, ASTM A53 and A135, and A795. In accordance with NFPA 13, piping with threaded joints 6" and smaller shall be Schedule 40, piping 8" and larger may be Schedule 30 minimum. For welded or roll-grooved joints, wall thickness shall be Schedule 5 minimum for piping 5" and smaller, 0.134" for 6" pipe, and 0.188 for 8" and 10" pipe. Schedule 80 pipe shall be used when working pressures exceed 300 psi.
 - a. Class 125 and 250 cast iron threaded fittings, ANSI B16.4
 - b. Class 150 and 300 malleable iron threaded fittings, ANSI B16.3
 - c. Class 125 and 250 cast iron flanged fittings, ANSI B16.1
 - d. Schedule 40, 150 psi, forged steel butt weld fittings, ANSI B16.9
 - e. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, UL Listed, FM Approved
 - f. All cutting oils, thread sealants and other products must be compatible with the CPVC piping installed.
 - 2. Schedule 10 minimum lightwall welded or seamless steel pipe with corrosion resistant coating, CRR Value of 1 minimum, ASTM A53 and A135
 - a. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, UL Listed, FM Approved
 - b. Lightwall, 150 psi, butt weld fittings, ANSI B16.9
 - 3. Chlorinated polyvinyl chloride (CPVC) pipe, ASTM D1784 and F442, UL Listed, plenum rated
 - a. Schedule 80 chlorinated polyvinyl chloride (CPVC), solvent welded socket, ASTM F439, UL Listed, plenum rated
 - b. Schedule 80 chlorinated polyvinyl chloride (CPVC), threaded, ASTM F437, UL Listed, plenum rated
 - c. CPVC piping is not to be installed in areas of exposed construction. Provide steel pipe and fittings in all areas where piping is exposed.
 - 4. Dry Systems
 - a. Schedule 40 welded or seamless internally and externally galvanized steel pipe, ASTM A53 and A135.
 - b. Schedule 10 minimum lightwall welded or seamless steel pipe with corrosion resistant coating, CRR Value of 1 minimum, ASTM A53 and A135 may be considered as a deductive alternate.
 - c. Class 150 and 300 internally and externally galvanized malleable iron threaded fittings, ANSI B.16.3
 - d. Grooved mechanical couplings and fittings with EPDM gasket, galvanized malleable iron or ductile iron, 800 psi minimum rating, ASTM A47 and A536, UL Listed, FM Approved
 - e. Provide chromium plated zinc or other approved corrosion prohibitant at all non-galvanized pipe threads, bolts and other areas to maintain the integrity of the galvanized system.

5. Flexible stainless steel piping connection, UL Listed and FM Approved, 1" NPS corrugated braided stainless steel hose assembly, 7" maximum bend radius installation, 175 psi rating
 - a. Viking Flexible Sprinkler Connection (FPSJ-1000), Victaulic I-Aquaflex series or Flexhead Series 2000
- C. All interior sprinkler piping shall meet the requirements of applicable sections of NFPA, and the Owner's Underwriter. All pipe, fittings, valves, and sprinkler system components shall be rated for working pressures as required by system design.
- D. All pipe, supports and hanger assemblies shall be in accordance with NFPA-13 and shall be UL Listed or FM Approved.
- E. All sprinkler hangers and support rods installed in areas exposed to exterior conditions, including parking decks, are to be fully galvanized or painted with two coats of Adsil Microguard corrosion prohibitor.
- F. All fire protection system components shall be of the required pressure rating to **eliminate the requirement for a main relief valve on the fire pump.**
- G. A remote inspector's test assembly is to be provided at the most remote point of each zone at the lower levels. The guest tower test assemblies are to discharge to the sprinkler drain risers adjacent to the standpipes. Coordinate required drain locations for the lower level test assemblies with the plumbing contractor prior to shop drawing submittals. Drains at grade level may be hard piped for discharge at the exterior subject to approval of the location during the submittal review.

2.3 VALVES AND ACCESSORIES

- A. Valves shall be installed where shown on the Drawings and elsewhere as required by codes or standards. All valves shall be UL Listed or FM Approved for fire protection service. All valves shall be provided with remote alarm tamper switches compatible with the Owner's central alarm system to monitor valve tampering. All switches and systems shall be Class B supervised. Provide 250 and 300 psi rated components at all locations as required by system pressure.
 1. Gate Valves
 - a. 2-1/2" and larger, Class 175 or 300, iron body, bronze mounted, solid wedge, outside screw and yoke, flanged ends, Stockham G-634 or F-670, listed for fire service
 - b. 2" and smaller, Class 175, bronze body and trim, solid wedge, outside screw and yoke, threaded ends, Stockham B-133
 - c. Provide UL Listed pressure regulating valves at all locations required due to system pressure. Valves shall be Potter Roemer Series 4000 or approved equal.
 2. Butterfly Valves
 - a. 4" and larger, Class 175, iron body, aluminum bronze disc, wafer or lug style, EPDM gasket, Stockham LG-52U
 - b. 2" and smaller, Class 175, bronze body, stainless steel disc threaded ends, Milwaukee BB-FP
 3. Check Valves
 - a. 2-1/2" and larger, Class 125, iron body, bronze disc, flanged or threaded ends, Stockham G-931 and G-927
 - b. 2-1/2" and larger, Class 125, iron body, bronze trim, flanged ends, Milwaukee 1800 series, flanged, UL Listed for fire service
 - c. 4" and larger, Mission fig. U-12 HMP, wafer body, UL Listed for fire service
 4. Backflow Preventers
 - a. Double check assembly shall be a complete assembly with two (2) independently operating check valves mounted in a common body, two (2) gate valves and four (4) test cocks, designed for horizontal installation. All valves shall be provided with tamper switches. The

complete assembly shall be UL Listed, FM Approved, designed to specifications and/or requirements of USC, CCCL, AWWA and ASSE and shall be sized for the full fire flow demand at a maximum of 6 psi pressure drop.

- 1) Double check backflow preventer shall be Ames Maxim 200 Series, Watts No. 709, Hersey No. 2 or approved equal.
 - 2) Double detector check backflow preventers shall be provided where required by local authorities; assembly shall be Ames Maxim 300 Series, Watts No. 770, Hersey Model DDC II or approved equal.
5. Fire Department Valves
- a. Fire Department valve shall be 2-1/2" cast brass body, 300 lb. rating, female N.P.T. inlet, male hose thread outlet, complete with cap and chain, brass finish. Valve shall be Potter Roemer Fig. 4065 or approved equal.
 - b. Provide UL Listed pressure regulating valves at all locations as required by system pressure. Valve shall be Potter Roemer 4000 Series or approved equal.
6. Floor Control Valve
- a. The floor control valve assembly shall be provided with a valve with supervisory switch. A check valve, pressure gauge, water flow switch and test connection with drain shall be provided downstream. The installation shall be per NFPA 13 requirements.
 - b. Provide UL Listed pressure regulating valves at all locations as required by system pressure. Valve shall be Potter Roemer 4000 Series or approved equal.
7. Siamese Fire Department Connection
- a. Fire department connection shall be 2-way exposed Siamese type, 2-1/2" x 2-1/2" x 4" size, cast brass body, polished chrome finish for all exposed surfaces, cast brass escutcheon, and brass female hose inlets having individual clapper valves, plugs, and chains. Assembly shall be located with the center line of the hose inlets at 2'-6" above adjacent grade. Inlet threading shall be National Standard or same as municipal fire department, as required. Assembly shall be UL Listed, FM Approved. Wall Mounted: Potter Roemer 5710 series or approved equal.
 - b. Free Standing: Potter Roemer 5760 series or approved equal.
8. Fire Valve Cabinet
- a. Cabinet shall be 20-gauge steel with polyester coating, recessed with flush full metal hinged door with cam catch and integral shelf for fire extinguisher. Cabinet shall be Potter-Roemer 1870 series or approved equal.
9. Roof Manifold
- a. Wall mount manifold to be three outlet horizontal configuration, cast brass body with threaded 2-1/2" male outlets complete with valves, chains and caps, rough brass finish. Provide accessible indicating type shut off valve with supervisory switch (normally closed) and automatic ball drip to roof. Roof manifold to be Potter-Roemer 5880 series or approved equal.

2.4 AUTOMATIC SPRINKLER SYSTEM MATERIALS

- A. The underground fire protection service shall be provided with thrust blocks and rods and clamps at the service entry.
- B. Automatic sprinklers shall be provided as follows:
 1. **[Guestrooms] [Dwelling Units]**

- a. Small frame glass element, semi-recessed, quick response, pendent and sidewall sprinklers shall be provided in all areas with ceilings as indicated on the Drawings. Temperature rating of sprinklers shall be 155 - 165 degrees. Sprinkler and escutcheon to be white finish. Sprinkler to be Viking Microfast Model M series with Model E-1 escutcheon.
2. **[Guestrooms] [Dwelling units]/Corridors**
 - a. Small frame glass element, semi-recessed, quick response, pendent and extended coverage sidewall sprinklers shall be provided in all areas. Temperature rating of sprinklers shall be 155 – 165 degrees. Sprinkler and escutcheon to be polished white finish. Sprinkler to be Viking Microfast Model M series with Model E-1 escutcheon.
3. **Public Spaces with Gypsum Ceilings**
 - a. Fully concealed type sprinklers, glass element, or fusible link style, quick response sprinklers shall be provided in all areas with gypsum ceilings unless otherwise noted. Temperature rating of sprinklers shall be 155 – 165 degrees. Ceiling coverplate shall be factory painted to match the adjacent ceiling color; submit painted sample to the Architect for approval. Sprinkler to be Viking Horizon Mirage concealed sprinkler or approved equal.
 - b. Small frame glass element, semi-recessed, quick response pendent sprinklers shall be provided in all areas with lay-in ceilings unless otherwise noted. Temperature rating of sprinklers shall be 155 – 165 degrees. Sprinkler and escutcheon to be white finish. Sprinkler to be Viking Microfast Model M series with Model E-1 escutcheon.
4. **Public and Back-of-House Spaces with Lay-in Ceilings**
 - a. Small frame glass element, semi-recessed, quick response pendent sprinklers shall be provided in all areas with lay-in ceilings unless otherwise noted. Temperature rating of sprinklers shall be 155 – 165 degrees. Sprinkler and escutcheon to be white painted finish. Sprinkler to be Viking Microfast Model M series with Model E-1 escutcheon.
5. **Institutional / Secure Spaces**
 - a. Fast response, small flush frame solder and lever link pendent and sidewall sprinklers of tamper-resistant construction for the use in institutional applications. Sprinkler and escutcheon to be polished chrome plated, temperature rating 165 degrees. Sprinkler to be Viking Institutional Quick Response Model VK410 pendent or VK-142 sidewall.
6. **Back-of-House Spaces and Unfinished Spaces with no Ceiling**
 - a. Quick response upright pendent sprinklers shall be provided in all areas with no ceiling. Temperature rating is to be 165 degrees unless conditions require higher temperature. Finish of sprinkler to be rough brass. Sprinkler to be Viking Microfast Model M.
7. **Parking Garages and Other Areas Exposed to Exterior Conditions**
 - a. Standard response upright sprinklers shall be provided in the parking garage areas supplied from the dry pipe system. All sprinklers shall have UL Listed polyester or Teflon corrosion protection. Temperature rating is to be 165 degrees unless conditions require higher temperature. Sprinkler to be Viking Micromatic Model M.
8. **Kitchen Coolers and Freezers**
 - a. Standard response semi-recessed chrome plated dry pendent sprinklers with sprinkler guards will be provided in all coolers and freezers. Barrel length shall be a minimum of 12" from the base of the tee to the top of the freezer. Sprinkler and escutcheon shall be polished chrome finish. Sprinkler shall be Viking Model M.
9. **Exterior Overhangs and Elevator Shafts**

- a. Standard response chrome plated dry horizontal sidewall or upright sprinklers are to be provided. Barrel length shall be a minimum of 12". Sprinkler and escutcheon shall have UL Listed polyester or Teflon corrosion protection at exterior overhangs and rough brass finish at elevator shafts. Sprinkler shall be Viking Model M.
- 10. Warehouse Areas
 - a. Early Suppression Fast Response (ESFR) pendant sprinklers are to be provided. Sprinklers are to be K factor of (14) or (25), brass finish, FM Approved. Sprinkler shall be Viking ESFR series.
- 11. Alternate acceptable manufacturers with equivalent sprinklers are Automatic, Anvil International, Gem and Reliable.
- 12. Sprinkler guards shall be installed on all sprinklers 7'-0" or less above floor.
- 13. Provide sprinklers at the highest and lowest level of all stairwells.
- 14. Provide sidewall sprinklers at the top end and bottom of all elevator hoistways. Sprinklers may be omitted from traction elevators on non-combustible elevator shafts and cabs which meet the requirements of ASME A.17.1 and where acceptable to the local authorities.
- 15. Sprinklers shall be prohibited in elevator machine rooms, elevator machine spaces and elevator hoistways of fire service access elevators.
- 16. Provide sprinklers in electrical rooms and elevator machine rooms unless specifically prohibited by local authorities; the sprinkler supply to each space shall be provided with a supervised valve and flow switch. Coordinate the intermediate temperature rating of the sprinkler head in all elevator machine rooms with the electrical contractor to ensure sprinkler operation will not occur prior to activation of the heat detector and the shunt trip circuit breaker.
- 17. Sidewall sprinklers shall be installed in all electrical rooms, electrical closets and elevator machine rooms where adequate coverage is provided. Upright sprinklers shall be installed in these spaces when coverage limitations of the sidewall sprinklers are exceeded. Piping shall not be installed above any electrical equipment, switchboard or panelboard. Piping shall offset around surface mounted light fixtures where possible, provide a minimum of 6" clearance below the bottom of the light fixtures at all locations.
- 18. The property is to be fully sprinklered throughout per the requirements of NFPA unless specifically noted otherwise. Elimination of sprinklers in electrical rooms, elevator shafts and elevator machine rooms shall be clearly indicated on the shop drawing submittal noting the exception applied for the deletion of sprinklers in these spaces.
- 19. The Contractor shall furnish and install a cabinet located in the fire service entry room with the quantity of each type of sprinklers and wrenches as required by NFPA 13:
 - a. facilities with less than 300 sprinklers – 6 minimum
 - b. facilities with 300 to 1000 sprinklers – 12 minimum
 - c. facilities with over 1000 sprinklers – 24 minimum
- 20. The Contractor shall provide and place suitable signs indicating the purpose of each control valve, test connection, main and auxiliary drain, etc., as required.
- 21. Provide 286 degrees intermediate temperature stainless steel pendant sprinklers in steam rooms and saunas. Sprinklers shall be Viking Micromatic Model N-2.
- 22. Provide higher intermediate temperature rated sprinklers in all areas required due to service conditions and as required by NFPA 13.
- 23. Provide sprinklers at the top floor and on alternating floors below in all linen and trash chutes.
- 24. Provide sprinkler connections to all required food service hood suppression systems.

2.5 DRY SPRINKLER SYSTEMS

- A. The Contractor shall furnish and install all specialty valves, pipe and equipment as required for the systems. The systems shall be complete with dry pipe valve, air compressor, accelerator, maintenance pressure compressor and associated trim and wired for interconnection to all required accessories, heat/smoke detectors, pressure switches, etc. as required.
- B. Pad-mounted storage tank/air compressors assemblies and riser-mounted air compressors shall be sized, furnished and installed as an integral part of the dry pipe sprinkler system and shall meet all requirements of NFPA.
- C. Should wet pipe systems in non-heated spaces be substituted for dry sprinkler systems as designed, the contractor is responsible for adding heat tracing, including all required electrical, insulation, supervision, etc. Substitutions or alterations to the original design shall be clearly stated on shop drawing submittals.

2.6 HEAT TRACING CABLE FOR FREEZE PROTECTION OF PIPING

- A. Provide pipe insulation with water proof covering and listed electric heat tracing cable on all fire protection standpipe, cross main, feed main and branch piping located within areas exposed to temperatures below 40° F and as indicated on the Contract Documents.
- B. Provide a complete UL Listed or FM Approved system of self-regulating heating cables, pipe insulation, controllers and components to maintain exposed fire protection piping at or above 40°F.
- C. Electric heat cable shall be installed linearly along the bottom of the pipe and allowance shall be made for all fittings, valves, pipe supports, etc. Cable shall be installed prior to insulation of the piping system.
- D. Electric cable shall be capable of maintaining a minimum water temperature of 40 degrees F at an ambient air temperature of 0 degrees F.
- E. The electric cable shall be the self-regulating type that responds to varying localized temperature conditions by varying the heat output along its length. This shall be accomplished by a self-regulating core which varies its resistance continuously with changes in temperature. A constant wattage heater is not acceptable.
- F. Provide single or multiple circuit digital controller as required by the project, connected to and monitored by the building BAS system. All enclosures shall be NEMA 4X.
- G. All heat tracing systems shall be supervised as required by NFPA 13.
- H. Provide a thermostat control, which de-energizes the heating cable when the ambient air temperature is above 40 degrees F (adjustable). While energized, the heat cable shall be entirely self-regulating.
- I. Provide all power connection hardware, splices, end seals, etc., to accomplish installation. All hardware shall be by the same manufacturer as the cable.
- J. Electric heating cable and accessories shall be UL Listed. Electric heating cable shall conform to all requirements of Division 16.
- K. Electric heating cable shall be Raychem XL or Engineer approved equal.
- L. All piping shall be insulated with 1" thick fiberglass insulation with factory applied all-service jacket. Piping exposed to exterior conditions shall be provided with 0.016" minimum corrugated aluminum metal jacketing with bands on 3'-0" centers.
- M. Heating-cable circuit shall be protected by a ground-fault device for equipment protection. This requirement is in accordance with section 427-22 of the NEC-2005.
- N. All heating cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide pipe freeze protection. Component enclosures shall be rated NEMA 4X to prevent water ingress and corrosion. Installation shall not require the installing contractor to cut into the heating-cable core to expose the bus wires. Connection systems that require the installing contractor to strip the bus wires or that use crimps or terminal blocks, shall not be acceptable.

2.7 TESTS AND DRAINS

- A. The Contractor shall provide test connections as required and as indicated on the Drawings. Inspector's test connections shall be fitted with sight glasses and the discharge of the drain riser shall be terminated above an adjacent hub drain with an air gap fitting. All tests shall have approved sight test assemblies as required by NFPA.

2.8 ELECTRIC MOTORS AND RELAYS

- A. Design, type and ratings of electric motors shall comply with the National Electrical Code, NEMA and Underwriters Laboratories Inc.
- B. Unless otherwise noted, or required for special applications, motors shall be equipped with sealed ball bearings.
- C. All motors to be mounted on equipment supplied under this section shall be as manufactured by General Electric, Westinghouse, or Louis Allis.

2.9 PIPING AND EQUIPMENT IDENTIFICATION

- A. A marker showing the service and an arrow indicating the direction of flow shall be applied on the following equipment installed under this section of the Specifications:
 - 1. All above ground fire protection standpipe and sprinkler piping
 - 2. All above ground sprinkler drainage piping
- B. Piping identification shall be applied in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each valve, wall and floor penetrations (both sides) and at connections to equipment. In addition, straight runs of piping shall be labeled at intervals not greater than 25 feet.
- C. Equipment and component parts thereof shall bear manufacturer's nameplate, giving manufacturer's name, size, type model number or serial number, and electrical characteristics, to facilitate maintenance and replacements. Nameplates of distributors or subcontractors are not acceptable. Electrical equipment shall be UL Listed as applicable.
- D. The letter size and background color shall conform to the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W.H. Brady Company, or Westline Products.
- E. All valves shall have a 1-1/2" diameter laminate plastic tag, engraved, black and white marking and a brass hook for attaching to valve stem. Tags shall have letters as large as practical, the number of the valve and the service such as indicated on the "Legend." The numbers of service shall be consecutive. Tags shall be similar to Seton 2961.
- F. All valves on pumps shall be similar to the valve tags specified above, except they shall be 2-1/2" in diameter, black with white number 2" high for attaching to valve stem by means of brass hook or small solid link brass chain. Tags shall be similar to Seton 2961-25.
- G. These numbers shall correspond with numbers indicated for valves and controls on two printed detailed lists and locational diagrams. These printed lists and locational diagrams shall state the numbers and locations of each valve and control and the section which it controls.
- H. The printed lists shall be prepared by Wrico pencil lettering or typed and shall be framed under glass, and mounted as directed by the Owner.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The Drawings are diagrammatic and the final arrangement of the work shall suit field conditions, the characteristics of the materials used and coordination with all other disciplines and the building components and finishes. Verify all dimensions in the field. Access and clearances must be provided and maintained for the proper operation, maintenance service and repair of the work.

- B. No sprinklers are to be installed prior to the building being completely sealed in from external moisture and conditions.
- C. All standpipe, sprinkler and drain piping exposed to sight in stairwells is to be painted with two coats of an epoxy based paint, color to be selected by the Architect.
- D. All equipment and materials shall be installed according to manufacturer's recommendations and shall meet the requirements of NFPA and the Owner's Insurance Underwriter.
- E. All sprinklers in spaces visible to public view shall be located symmetrically in relation to ceiling design elements, lighting fixtures, speakers, diffusers, etc. All ceiling components are to be indicated on the submittal drawings as noted previously to ensure coordination with all ceiling elements and devices. Piping to sprinklers in these areas is to be provided with arm-overs or flexible sprinkler drops to allow for exact placement of sprinklers.
- F. Sprinklers shall be installed at the centerpoint of all 2' x 2' lay-in ceiling tiles, and at the centerpoint or 1' from the ends of 4' x 2' ceiling tiles.
- G. Where pipe is installed above suspended ceilings, it shall be located in the clear space above the suspended ceiling and the pendent sprinklers shall be located to clear the ceiling supporting grid system, the ceiling mounted fixtures, and air conditioning ducts and outlets.
- H. The Contractor shall install additional pendent sprinkler heads under all ductwork or other obstructions which are over 48" wide in accordance with NFPA-13 in areas of exposed construction.
- I. All sprinklers located in areas that are to be painted shall be protected prior to painting.
- J. Provide a pressure gauge at the top level of all standpipes.
- K. Where wet fire protection standpipe, cross main, feed main and branch piping are located within areas exposed to temperatures below 40° F, listed electric heat tracing and pipe insulation shall be installed in accordance with the requirements of Section 2.06 – Heat Tracing Cable for Freeze Protection of Piping.

3.2 PREPARATION

- A. Arrangements shall be made to have the openings, inserts, sleeves, blockouts, and such other incidentals set in place ahead of the construction work, where practical, to eliminate the need of cutting and patching. If coring becomes necessary for installation of the work, it shall be done under this section. All holes shall be neatly patched and finished to match the adjoining work in a manner approved by the Architect. All coring shall be performed in a manner not to weaken the structural parts and the manner and method shall be submitted to the Structural Engineer for approval.

3.3 SLEEVES AND ESCUTCHEONS

- A. The Contractor shall furnish and set pipe sleeves and inserts for all work under this section and shall be responsible for their proper and permanent location. In the event that failure to do so requires cutting and patching, the remedial work shall be the responsibility of the Contractor.
- B. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter 1-1/2" (3/4" annular space) larger than the outside diameter of the pipe or insulation on covered lines, except as otherwise specified herein.
- C. Sleeves for all pipes through walls, beams and partitions shall finish flush with the finish line of the walls, beams and partitions.
- D. Sleeves for all piping shall extend 1/2" above finish floor, (except where under partitions, the sleeves shall be flush with the bottom of the partition) and after the installation of pipe shall be packed and made watertight with fire stopping sealant to maintain separations and fire ratings.
- E. Where pipes pass under footings and through exterior walls, sleeves shall be of galvanized steel pipe and shall be not less than 4" larger than the pipe being sleeved. Sleeves shall be made watertight where passing through waterproofed surfaces, exterior wall, and floor slabs on grade. Waterproofing shall be done by means of a steel slip on

welding flange, continuously welded at the center of the sleeve and shall be painted with one coat of bitumastic paint inside and outside. The space between sleeve and pipe shall be packed with oakum to within 2" of each face of the wall; (to within 2" of the top of sleeve at floors). The remaining space shall be packed and made watertight with a waterproof mastic. Mechanical expansion type rubber seals such as manufactured by Calpico Ind. and Thunderline Corporation are acceptable as alternate method of water proofing piping penetrations.

- F. Sleeves through floors or interior masonry walls shall be of galvanized steel pipe or wrought iron pipe size except where located in concealed pipe spaces where they may be of 22 gauge galvanized sheet steel if fire rating is maintained.
- G. Sleeves through interior masonry partitions shall be of 22-gauge galvanized sheet steel.
- H. Sleeves for piping to receive insulation shall be large enough to allow continuous insulation through sleeves.
- I. Spacing between or location of pipe sleeves in floor slabs, structural beams or structural walls shall be subject to the Structural Engineer's approval.
- J. Where pipes pass under load bearing footings they shall pass through a coated steel pipe sleeve as described above and extend past a 45 degree line out from the bottom of the load bearing structure. Concrete shall be used as backfill in the portions of trench within the 45 degree pressure line.
- K. Escutcheons shall be provided around all exposed pipe passing through walls, partitions, ceilings and floors in finished spaces. Escutcheons shall be of sufficient outside diameter to cover the sleeve opening and shall fit snugly around the insulated or bare pipe and to the wall, partition, floor or ceiling.

3.4 WORKMANSHIP

- A. All work shall be coordinated with the work to be performed or installed under other sections of these Specifications.
- B. All work shall be executed in a workmanlike manner by workmen skilled in this type of work and shall present a neat appearance when completed.
- C. Offsets shall be provided as required to avoid interference and conflicts with other work, to maximize headroom, or to improve the appearance of pipe runs. All pipe supports, structural members, hangers and other apparatus necessary to support firmly and substantially the various components of the systems shall be provided under this section.
- D. Nameplates, catalog numbers and rating identifications shall be securely attached to equipment with screws or rivets. Adhesives or cements will not be permitted.
- E. The subcontractor shall be responsible for the protection of the work from injury and shall protect all apparatus with suitable enclosures.

3.5 ERECTION AND INSTALLATION

- A. Installation and workmanship requirements are specified hereinafter.
- B. This subcontractor shall be responsible for the furnishing and installing of all support steel, hangers, rods, clamps, etc., to provide adequate support of all Fire Protection equipment specified herein. All support assemblies shall be UL Listed or FM Approved.

3.6 CLEANING OF SYSTEMS AND PREMISES

- A. At all times, keep the premises clear of undue accumulation of rubbish.
- B. On completion of the work, remove all rubbish and debris resulting from this Contract, and dispose of same.
- C. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion. All equipment shall be partially or fully re-painted as required to provide an appearance of new equipment.

3.7 TESTS

- A. Tests of all fire protection systems and equipment, underground and inside piping including alarm and detection devices shall be scheduled with one (1) week prior

notification to a local representative of the Underwriter and the Architect. All tests and test procedures shall be in accordance with the applicable NFPA standards. After completion of all tests, the "Contractor's Materials and Test Certificate" shall be submitted to the Architect.

- B. The Contractor shall supply all materials, labor, utilities and power required for testing. Preliminary tests shall be performed to prove work is satisfactory prior to requesting a test inspection. Sectional tests shall be made before insulation or concealing any piping.
- C. Repair all defects disclosed by tests or, if required by the Architect, replace defective work with new systems and materials at no additional cost to the Owner. Repairs to piping systems shall be made with new material. No caulking of screwed joints, cracks or holes will be accepted. Make tests in stages to facilitate work of others.
- D. The Contractor shall be responsible for the repair and/or replacement cost installed and finishes damaged by leaks, tests and/or repair and replacement of his work at no additional expense to the Owner.
- E. Prior to final acceptance by the Owner, submit the "Contractor's Material and Test Certificates" indicating system compliance with all applicable sections of NFPA.

3.8 SUBCONTRACTOR'S WARRANTY

- A. The Contractor shall warrant all equipment and the installation to function properly for a period of one year from date of final acceptance of the work.
- B. Defects becoming apparent within the warranty period shall be repaired by the Contractor. In addition, all damages to installed work and finishes resulting from such defects shall be the responsibility of this Contractor either to repair or replace to equal the existing installation.
- C. This warranty shall in no way obligate the Contractor to repair any and all damages resulting from accident or improper operation or care on the part of the Owner.

END OF SECTION

SECTION 15550

FIRE SUPPRESSION SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, services, equipment and appliances required for fire protection systems work specified herein.

1.2 DESIGN AND FABRICATION:

- A. Requirement: Determine and install the number of systems and nozzles required for protection of ducts, charboiler, and other cooking appliances that require protection in accordance with the NFPA-96, latest edition of the time of bidding.
- B. Operation: Systems shall operate automatically and have manual button or remote pull station located in the exit area from the kitchen. Gauges on supply bottles shall be visible from the floor.

1.3 INSPECTION AND TESTING

- A. Conduct a test of all systems in the presence of the local Fire Marshal and a representative of the Owner to assure the continuity of all piping and operation of the system.

1.4 SUBCONTRACTOR'S QUALIFICATIONS

- A. The systems shall be designed and installed by an authorized licensed distributor, who has been approved to install and service the system by the local Rating and Fire Prevention Bureau.

1.5 ACCEPTANCE BY GOVERNING BODIES

- A. Upon completion of the installation, the Contractor shall obtain a Certificate of Compliance showing the installation is acceptable by the governing bodies.

PART 2 PRODUCTS

2.1 SYSTEMS

- A. Ansul R-102 or approved equal automatic liquid chemical fire suppression systems. All components and systems shall be listed by the Underwriter's Laboratories and shall be the U.L. Label. All heads shall be chrome-plated and all exposed piping and conduit shall be chrome-plated or stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in complete accord with the manufacturer's written specifications and recommendations, all governing codes and ordinances and NFPA-96, latest edition at the time of bidding. Identify all pull stations and chemical bottles with Micarta plates as described in SECTION 15050. Identify piping with descriptive labels as described in SECTION 15050. Support piping as described in section 15060. Install escutcheons where pipe and conduit pass through walls or ceilings.

3.2 GAS SHUT OFF VALVES

- A. Furnish and install an automatic mechanical gas shut-off valve or valves with manual reset switch as required within the gas piping serving the protected equipment.

3.3 CLEAN-UP

- A. Upon completion of the work of this section, remove all debris relating to the conduct of this portion of the work from the premises.

END OF SECTION

SECTION 15000

HVAC GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Refer to Division 1 - General Requirements and any and all Supplementary or Special Requirements, all of which apply to work described in Division 15 - HVAC as if written in full herein.
- B. The scope of work described in these Specifications and/or indicated on the Drawings shall include the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all HVAC systems. All HVAC work shall be accomplished by workmen skilled in the various trades involved.
- C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher implied cost shall be included in the bid, and the Architect shall be notified of the discrepancy in writing.
- D. All work performed under this specification shall be accomplished in accordance with the requirements and provisions of the following sections:

1.2 CODES AND STANDARDS

- A. All HVAC work shall conform to all ordinances and regulations of the City, County and State where the work will take place, including the requirements of all authorities having jurisdiction. The following codes, standards and references shall be observed as a minimum:
 - 1. The 2012 International Codes
 - 2. West Virginia Amendments to the Code
 - 3. National Fire Protection Association (NFPA) Standards and Guidelines
 - 4. Local and State Fire Marshal requirements
 - 5. Local Building and Inspection Department requirements
 - 6. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
 - a. Standard 90.1-2007 – Energy Standard for Buildings Except Low-Rise Residential Buildings
 - b. Standard 62.1-2007 – Ventilation for Acceptable Indoor Air Quality
 - c. Standard 55-2004 – Thermal Environmental Conditions for Human Occupancy
 - d. Other Standards and Guidelines as applicable
 - 7. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Manuals
 - 8. Underwriters Laboratories Inc. (UL)
 - 9. Americans with Disabilities Act (ADA)
- B. If Code or other requirements exceed the provisions shown on the Contract Documents, the Engineer shall be notified in writing. Where requirements of the Contract Documents exceed Code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.3 WORK INCLUDED

The HVAC Systems installed and work performed under this Division of the Specifications shall include, but not necessarily be limited to:

- A. Airside Systems

1. Equipment: including fans, unitary air conditioners, air handling units, make-up air units, dedicated outdoor air units, etc.
2. Ductwork and Accessories: including sheet metal, kitchen hood and dishwasher exhausts, flexible ductwork, fire and smoke dampers, access doors, etc.
3. Air Distribution Devices: including registers, grilles, diffusers, etc.
- B. Refrigerant and Water Systems
 1. Piping, Tubing and Accessories: including pipe, refrigerant tubing, valves, solenoids, thermal expansion valves, strainers, air vents, pipe and equipment drains, condensate drains, etc.
- C. Equipment, Ductwork and Piping Supports
 1. Equipment Mounts: including roof curbs, concrete housekeeping pads, equipment rails, miscellaneous steel, etc.
 2. Hangers and Support Devices: including inserts, hanger rods, unistrut, cross-bracing, anchor bolts, pipe anchors, restraints, etc.
 3. Vibration Isolation: including inertia bases, flexible couplings, expansion devices, springs, waffle pads, etc.
- D. Insulation
 1. Ductwork Insulation: including exterior duct wrap, internal duct liner, fire wrap, etc.
 2. Piping and Equipment Insulation: including preformed, board and wrap.
- E. Miscellaneous HVAC Equipment: Unit heaters, wall heaters, roof hoods, heat tracing, etc.
- F. Automatic Temperature Controls
 1. Decentralized: including all thermostats, control dampers, control valves, programmable controllers, line and low-voltage wiring, smoke detectors, pressure sensors, gas sensors, control logic, etc.
- G. Labor and Equipment: including project management, supervision, tradesmen, lifts, forklifts, cranes, scaffolding, saws, wrenches, etc.
- H. Equipment and Valve Identification
- I. Start-up and Commissioning
- J. Demonstration and Owner Training
- K. Testing, Adjusting and Balancing

1.4 ENGINEER'S DRAWINGS

- A. The locations, arrangement and extent of equipment, devices, ductwork, piping, and other appurtenances related to the installation of the HVAC work shown on the Drawings are approximate and define the intent of the design. The Contractor shall not scale Engineer's Drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy.
- B. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

1.5 EQUIPMENT, MATERIALS AND BID BASIS

- A. Manufacturers' names, model numbers, etc. cited on the Drawings and in the Specifications are for the purpose of describing type, capacity, function and quality of equipment and materials required. All project design and coordination between disciplines has been performed as if the named manufacturer and specific piece of equipment will be provided to the project by the Contractor.
- B. Alternate equipment and/or materials other than that named on the Drawings and in the Specifications may be proposed for use except for national account equipment such as Lennox, but all equipment and materials shall conform entirely to the specified base

items. Proposed alternate equipment shall be substantially equal in size, weight, construction and capacity. Alternate equipment and materials shall be submitted only as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. Requests for prior approval of alternate products shall be made at least ten (10) days prior to the bid date and as required by Division 1 - General Requirements. The Architect and Engineer shall consider the use of the alternate equipment based on the supportive documentation made available to him, and shall approve or disapprove any proposed alternates. The decision of the Architect and Engineer shall, in all cases, be final.

- C. The Contractor shall coordinate the installation of all HVAC equipment proposed for use in this project with all building trades (architectural, structural, electrical, etc.). Coordination shall be accomplished prior to, and shall be reflected in, the equipment submittals for approval. When the Contractor requests substitution of alternate equipment, it is with the knowledge that he shall be responsible for any and all costs required by the substitution, including necessary engineering and construction revisions in his or any other contract or trade to satisfy the design intent shown on the Plans and described in the Specifications.
- D. All materials exposed within HVAC plenums shall have a flame-spread index of not more than 25 and a smoke-developed rating index of not more than 50 unless otherwise allowed by code.

1.6 SUBMITTALS

- A. The Contractor shall prepare, submit and obtain Engineer's review of all manufacturers' data on the HVAC equipment and systems prior to ordering, purchasing or installing any equipment or materials. Six (6) hard copies of the complete submittal are required, five of which will be reviewed and returned by the engineer. Electronic submittals (e.g. .pdfs, etc.) may be acceptable, if approved by the architect and described in Division 1 - General Requirements. All submittals shall be transmitted simultaneously in hard ring binders (or in a single .zip file), with the associated specification sections cited and the items submitted clearly identified. Partial submittals will be returned without review. Submittals, as a minimum, shall include:
 - 1. All HVAC items scheduled on the Drawings
 - 2. Equipment arrangement, ductwork and piping drawings. Contractor drawings shall be prepared at a minimum scale of 1/8" = 1'-0". A scale of 1/4" = 1'-0" scale is preferred. Drawings shall be indicative of actual equipment purchased and shall show all offsets, transitions, fittings, dampers, valves, hanger locations, etc. Sections are required in spatially tight areas (e.g. kitchens, laundries, central plants, mechanical rooms, etc.) The following will guide the Contractor as to minimum drawing detail required:
 - a. Clearly indicate top and bottom of duct and pipe elevations. All elevations shall be coordinated as to not conflict with structural, plumbing, electrical and architectural trades.
 - b. Indicate all offsets (both vertical and horizontal).
 - c. Indicate graphically all duct and pipe joints and their lengths.
 - d. Submit duct and pipe-work fabrication schedule indicating duct size range with minimum duct material gauges, pipe schedule being used, duct and pipe connection joint types, section lengths, duct reinforcement type and spacing, etc.
 - e. Indicate graphically all ductwork to be fabricated with internal duct liner.
 - f. Indicate all insulation for ductwork and piping.
 - g. Indicate all dampers and valves as shown on design documents and called for in the specifications.
 - h. Indicate all flexible connectors where required by specifications and notes.
 - 3. Flexible ductwork, insulation and linings

4. Dampers, louvers, air distribution devices
 5. Manufacturer's cut sheets of all piping and tubing materials
 6. Where split systems are used in a "long line application," submit manufacturer's refrigerant line set routing drawings and engineered calculations supporting the recommended suction and liquid line sizes. Identify and provide cut sheets of any and all accessories required to make the system complete, functional and reliable.
 7. Refrigerant type and charge (lbs.) for each item of equipment utilizing refrigerant.
 8. Valves, thermometers, pressure gauges
 9. Roof curbs, equipment supports, hanger systems, vibration isolators
 10. Control equipment, systems and diagrams
 11. Test and balance reports
- B. All submittal approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.
- C. Review of submittals by the Engineer does not relieve the Contractor from responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements (roof penetrations, wall penetrations, floor penetrations, curbs, electrical, etc.) of all approved equipment with the other trades and disciplines.
- D. All submittals shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.
- E. The Contractor shall provide a written statement confirming coordination of voltage requirements for all HVAC equipment requiring an electrical connection. Statement shall bear the names and signatures of the HVAC and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the Electrical Drawings, as well as with the Electrical Contractor.

HVAC Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

Electrical Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

- F. Provide Material Safety Data Sheet (MSDS) or letter from manufacturer certifying the VOC content for each adhesive, sealant, paint and coating.
- G. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01600 Sustainable Design Requirements.

1.7 PERMITS

- A. The Contractor shall obtain all permits and inspections required for the installation of the HVAC work and pay all charges incident thereto. He shall deliver copies of all certificates of permit and inspection to the Architect.

1.8 COORDINATION OF TRADES

- A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
- B. Piping and other HVAC equipment shall not be installed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated ductwork, piping and other HVAC equipment installed should they interfere with the proper installation and mounting of electrical, plumbing equipment, ceilings and other architectural or structural finishes.
- C. The Contractor shall coordinate the elevations of all ductwork, piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.
- D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.
- E. The HVAC Contractor shall confirm that his work does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.
- F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.
- G. Coordinate power and fire alarm requirements of all combination fire/smoke dampers and smoke dampers with the electrical contractor.

1.9 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall prepare a minimum of two (2) instruction manuals and one CD, one of which shall be submitted to the Architect for the Engineer's review. Manuals shall describe installation, operation and maintenance of all HVAC equipment and shall include copies of control schematics, sequences of operation, function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturers' drawings, pamphlets, data, parts lists, and instruction manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in (a) 3-ring binder(s).

1.10 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. The record shall be by red-line mark-up on the most current set of Engineer's Drawings kept in the field office. After all work is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the Engineer's Drawings. As-built drawings shall accurately depict actual final arrangement of all HVAC items. As-built drawings and one CD shall be delivered to the Architect.

1.11 WARRANTY

- A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.
- B. All reciprocating and scroll air conditioning compressors shall be provided with an extended 5-year parts warranty.
- C. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

PART 2 PRODUCTS

2.1 GENERAL

- A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Engineer's Drawings shall be suitable for the intended use and shall be subject to approval by the Engineer.
- B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.
- C. All equipment shall bear the inspection Label of Underwriters Laboratories Inc.
- D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.

2.2 ELECTRICAL WORK

- A. Except as otherwise specified or noted, electrical equipment used for HVAC systems shall be as specified herein.
- B. Motor controls, system controls, starters, disconnects, pilot lights, push buttons, etc. shall be furnished by the HVAC Contractor compatible with the apparatus that it operates. Electrical equipment shall be wired for the voltage shown on the Electrical Engineer's Drawings.
- C. Electric motors shall be high efficiency, open drip-proof type unless otherwise specified. Motors shall be standard NEMA continuous duty type and shall bear the UL Label. Motors shall be selected with a minimum of 15% safety factor greater than the fan brake/horsepower (e.g. 4.75 BHP would require a nominal 7-1/2 HP motor). The motor service factor shall not be used as part of the safety factor. All motors shall have thermal overload protection. Motors shall meet Table MG-1-12C of EPACT 1992.
- D. Motors controlled by a variable frequency drive (VFD) shall be inverter duty rated and fully compatible with the VFD provided.
- E. Starters for motors 1/3 HP and smaller shall be manual type, and for 1/2 HP and larger, shall be magnetic type. Starters shall be minimum size 0, combination type (with disconnect and lockable handle) with molded case circuit breaker. Starters for motors with remote or automatic control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.
- F. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type unless otherwise indicated on the Drawings or specified herein. Starters for motors 75 HP and greater shall be solid state, reduced voltage type.
- G. Motor controls shall be either "Hand-Off-Auto" switches or "On-Off" push buttons with one indicating light. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.
- H. Motor starters that are not an integral part of HVAC equipment shall be installed in conformance with Division 16 - Electrical requirements.
- I. All "loose" disconnects and starters shall be installed by Division 16.
- J. Power wiring to disconnects, starters, and equipment shall be provided and installed by Division 16. All equipment requiring electrical power shall be provided with disconnect switches at each piece of equipment. Coordinate switch type (fused or non-fused) with equipment characteristics, manufacturer's recommendations and electrical drawings.
- K. Provide all system controls and associated control and interlock wiring for complete and operable systems. 120 volt and higher wiring shall be MC cable or in conduit in accordance with local codes and the materials and installation requirements of Division 16 - Electrical.
- L. Coordinate power and fire alarm requirements of all combination fire/smoke dampers and smoke dampers with the electrical contractor.
- M. All starters and variable frequency drives shall be labeled on the face of the device with a semi-rigid plastic laminate nameplate with 1" high white letters on a black background securely affixed to the equipment. The label shall indicate equipment served (equipment tag used on the Drawings). Labels shall be furnished and installed by the Contractor.
- N. All starters for 3-phase equipment shall have overload devices in each phase.

- O. Wiring diagrams shall be furnished by the Contractor.
- P. Acceptable manufacturers shall be General Electric, Square D, Eaton, Siemens and Allen Bradley.

2.3 AIR FILTERS

- A. All filters shall be U.L. 900 classified.
- B. Filters shall be pleated disposable type (MERV 6 minimum) unless specified otherwise.
- C. Install one set of new filters every two weeks in air handling equipment during construction and install a new set prior to test and balance. Remove temporary filter media prior to test and balance. Clean and vacuum all inlets prior to test and balance.
- D. Temporary roll filter media shall be provided at the inlets to all air handling equipment operated during construction. Remove temporary filter media prior to test and balance. Clean and vacuum all inlets prior to test and balance.

PART 3 EXECUTION

3.1 GENERAL

- A. All equipment and materials shall be completely installed, adjusted, and fully operational with all accessories and connections.
- B. Equipment, piping, ductwork, etc. shall fit into the spaces provided in the building and shall be installed at such time and in such a manner as to avoid damage and as required by the job progress. The Contractor shall coordinate work with other trades and locate work described herein to avoid interferences with structural, electrical and architectural work. Equipment, accessories and similar items requiring normal servicing or maintenance shall be accessible.
- C. The Engineer reserves the right to direct the removal of any item which, in his opinion, does not present an orderly and reasonably neat or workmanlike appearance. Such removal and replacement shall be done when directed by the Engineer and without additional cost to the Owner.
- D. Listed mounting heights are to the finished bottom of the device unless otherwise noted.
- E. All work shall be designed and installed to comply with the requirements for the seismic design category and use group for the area in which the building is constructed.

3.2 STORAGE AND PROTECTION OF MATERIALS

- A. During construction, all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers, etc.
- B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, and test plugs until final connection to system is made.
- C. All equipment, piping and ductwork shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.
- D. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in a manner to prevent damage to materials during storage and handling. Replace damaged materials.
- E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.3 CUTTING AND PATCHING

- A. The work shall include all cutting and patching required as part of the HVAC installation. Refer to Division 1 - General Requirements.

3.4 CONCRETE WORK

- A. Construct curbs, pads and similar supports for equipment where required.

- B. Provide 4" thick housekeeping pads for all floor mounted equipment, extending 6" beyond the area occupied by the equipment. Dowel pads to structural slab.
- C. Perform concrete work in accordance with applicable portions of Division 3 - Concrete. Minimum compressive strength of concrete shall be same as specified for slabs on grade.
- D. Mix and install grout for HVAC equipment base bearing surfaces and anchors. Provide forms as necessary and place grout to completely fill equipment bases.

3.5 EQUIPMENT SUPPORTS

- A. Major equipment supports (structural steel frames, framed structural slab and wall openings, etc.) shall be furnished and installed by others; however, the HVAC work shall include furnishing and installation of all miscellaneous equipment supports, structural members, rods, clamps and hangers required to provide adequate support of all HVAC equipment.
- B. Unless otherwise shown on the Drawings, all HVAC equipment, piping, and accessories shall be installed level, square, and plumb.
- C. All equipment, piping, etc. supported by structural bar joists shall be supported only by the top chord of the joists. Hangers shall not be attached to the bottom chord of any joists.

3.6 PIPE AND DUCTWORK PENETRATIONS

- A. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe and ductwork penetrations. Sleeves for pipe shall be schedule 40 black steel. Sleeves for ductwork shall be 20-gauge galvanized steel. Sleeves shall be sized to provide a minimum of 1/4" clearance between the sleeve and pipe or duct. For insulated pipes or ducts, the clearance shall be between the sleeve and the insulation.
- B. As far as possible, all pipe and ductwork penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.
- C. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, escutcheon plates shall be chrome plated. All escutcheon plates shall be sized to completely conceal the penetration.
- D. Ductwork penetrating walls or floors of any material shall be installed with closure plates on both sides of the penetration. Pipe penetrations through exterior walls shall be sealed weather-tight with expandable link type seals by Thunderline, Linkseal, or Engineer approved equal.
- E. All pipe and duct penetrations of fire, smoke, or fire and smoke-rated assemblies shall be fire-stopped as required to retain the integrity of the UL-rated assembly. Fire barrier products shall be as manufactured by Tremco, Hilti, 3M, Metacaulk, Nelson, or approved equal. Refer to Division 7 - Thermal and Moisture Protection.

3.7 FLASHING

- A. All piping and ductwork penetrating roofs shall be flashed in an approved manner, shall be watertight, and shall conform to the requirements detailed in Division 7 - Thermal and Moisture Protection.

3.8 EQUIPMENT LABELING

- A. All HVAC equipment shall be labeled. This shall include all central plant, air handling or air conditioning equipment, air terminals, and other similar and miscellaneous equipment.
- B. Labels for air terminals or other devices shall be located for optimum visibility through access panel or removed ceiling tiles.
- C. Equipment labeling shall be one of the following, unless noted or specified otherwise:
 1. Permanently attached plastic laminated signs with 1" high lettering
 2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel

3.9 CLEANING

- A. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the job site.
- B. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, ductwork, etc. shall be thoroughly cleaned both inside and out.
- C. After cleaning, filters shall be installed where required and all systems shall be tested and balanced.
- D. After testing and balancing and just prior to Owner review and acceptance, all systems shall be finally cleaned and left ready for use.

3.10 PAINTING

- A. Painting will be done under Division 9 - Painting except as otherwise noted, but the HVAC Contractor shall leave all surfaces of work free of rust, dirt and grease.
- B. The HVAC Contractor shall touch-up any equipment scratched in shipment or during installation to match original finish. Touch-up painting of HVAC equipment shall be part of the HVAC work.
- C. Any visible ductwork through grilles, registers and diffusers shall be painted flat black.
- D. Provide one coat of rust preventive primer on all new structural steel supports and new ferrous surfaces not galvanized, including HVAC piping. Rust preventive painting shall be part of the HVAC work. Rust preventive paint shall be "Rust Destroyer" by Advanced Protective Products, Inc., Fairlawn, NJ, (201) 794-2000. Product shall have a 5-year warranty when applied directly over rust. Clean and prepare surface per manufacturer's recommendations.
- E. All painting and coating shall match the original finish and shall conform to the requirements detailed in Division 9 - Finishes.
- F. Do not paint over equipment nameplates, nonferrous hardware, accessories or trim.

3.11 PERFORMANCE AND DEMONSTRATION TESTS

- A. All testing and demonstration of any and all HVAC systems required for acceptance by any authorities having jurisdiction shall be included as part of the HVAC work. This shall include the furnishing of any and all testing equipment, smoke generation devices, and any other required equipment or accessories, and all necessary labor required to perform any required tests or demonstrations. The Contractor shall coordinate and verify all devices, equipment and sequence of testing and/or events with such authorities having jurisdiction. The Contractor shall perform a minimum of two (2) satisfactory preliminary tests or demonstrations prior to any formal tests and/or demonstrations for any code authorities, and shall give a minimum of five (5) days advance notice to the Engineer of any and all preliminary tests and/or demonstrations, indicating the date and time of such tests.

3.12 TRAINING

- A. Upon completion of the work, the Contractor shall conduct operation and training session(s) for the Owner's key operating personnel. These sessions shall be of sufficient length and duration to adequately explain the design intent and proper operating and maintenance techniques for all HVAC equipment and systems. After these sessions are completed, the Contractor shall provide a copy of a signed statement by the Owner that his personnel are thoroughly familiar with and capable of operating all HVAC equipment and systems.

END OF SECTION

SECTION 15020

DUCTWORK AND ACCESSORIES

PART 1 GENERAL

1.1 DESCRIPTION

- A. All work in this section shall be subject to the provisions of Section 15000 - HVAC General.
- B. Furnish and install all material, labor, accessories, etc. shown on the drawings and as specified herein to completely install all ductwork systems.
- C. Ductwork systems shall be classified as follows:
 - 1. Static pressure class +2 in. wg - from constant volume air handling unit to supply diffusers, and all return and exhaust ductwork
- D. Ductwork shall be constructed according to the latest edition of SMACNA ductwork construction standards applicable to the system pressures described above, and the system material construction.
- E. Duct sizes shown on the drawings are nominal inside clear.

1.2 SUBMITTALS

- A. For all fire dampers, combination fire and smoke dampers, and smoke dampers, submit UL approved installation instructions for each specific application.

PART 2 PRODUCTS

2.1 DUCTWORK

- A. All ductwork shall be constructed of galvanized steel sheets of the thickness listed in the SMACNA manuals for the pressures referenced above, or of 1" thick (1½" thick if required by the applicable energy code) resin bonded fiberglass with fire resistant foil-scrim-kraft vapor barrier.
- B. Rectangular sheet metal duct elbows shall be smooth radius type without turning vanes or square (or mitered) type with turning vanes. Sharp throat elbows (ASHRAE Fitting No. CR3-2) shall not be permitted. Round sheet metal duct elbows shall be smooth radius type without turning vanes, gored type or mitered type with turning vanes.
- C. Unless otherwise indicated, elbows shall have a centerline radius of not less than 1½ times the width of the duct. Where space limitations necessitate use of short radius or square elbows, provide turning vanes.
- D. Ductwork connecting kitchen exhaust hoods to rooftop exhaust fans shall be constructed of 16-gauge black steel with welded seams. All grease exhaust ductwork shall be constructed and installed according to requirements of local code authorities and NFPA 96 (latest edition) requirements. Slope duct down towards hood at 1" per linear foot or per local code requirements. Install gasketed access doors at each change of direction.
- E. Kitchen hood exhaust ductwork shall be insulated per NFPA 96 (latest edition) and local code requirements. Kitchen hood supply ductwork shall be insulated per specifications for HVAC supply ductwork.
- F. Dishwasher exhaust ductwork above the ceiling shall be either 18-gauge stainless steel or 16-gauge aluminum. All seams and joints shall be welded liquid-tight.
- G. Dishwasher exhaust risers and trim collars below the ceiling shall be 18-gauge, type 304 stainless steel finished in a 180 grit polished finish.
- H. All dishwasher exhaust ductwork shall slope down toward the dishwasher connections at 1/4" per foot and be constructed with no pockets which will trap condensation.

2.2 COMBINATION FIRE AND SMOKE DAMPERS

- A. Photoelectric [ionization] Type Smoke Detector (if indicated on the drawings): rated for air velocities from 300 to 4000 fpm; UL268A listed, factory mounted internally on the damper sleeve.

2.3 FLEXIBLE DUCT CONNECTORS

- A. Install flexible duct connectors at connections of sheet metal duct to motor driven equipment, or otherwise noted. Flexible duct connectors shall be glass fabric coated with neoprene, suitable for the intended service. Flexible duct connectors shall be Duro Dyne Excelon or approved equal. Install per manufacturer's instructions, and support sheet metal ductwork so that no weight is supported by the flexible duct connector.
- B. Flexible connectors exposed to the weather shall be UV and ozone resistant.
- C. Fabrics, coating and adhesives shall be tested in accordance with UL 701 and have a maximum flame spread/smoke developed rating of 25/50.
- D. Flex duct connectors shall also be provided at building expansion joints.

2.4 ACCESS DOORS

- A. Hinged, gasketed and latched access doors and/or panels shall be installed at each fire and smoke damper, each duct mounted smoke detector, each valve, at each duct mounted balancing damper or any other mechanical equipment or device that requires accessibility. Doors and panels shall be sized (minimum 18" x 18", duct size allowing), and located to optimize access to dampers, detectors, and other equipment for service and replacement. Access doors in ductwork shall be per SMACNA Standards. Access panels in walls, ceilings or other surfaces shall be coordinated with architectural finishes and selected by the architect.
- B. Access doors shall be designed for five times the pressure of the duct in which it is mounted.
- C. Access doors for grease exhaust ducts shall be in accordance with NFPA 96 (latest edition). Vertical grease ducts shall have an access door at each floor level in an inconspicuous location.

2.5 FLEXIBLE DUCTWORK

- A. Flexible ductwork shall be UL Class 1 air duct.
- B. Flexible ductwork shall be installed between main supply ducts and diffusers. Length shall be a maximum of 8'-0" long, except in residential applications, where the length shall be as indicated.
- C. Flexible ductwork shall be Thermaflex M-KE R-6 (R value = 6.0 minimum or as required by local energy code) flexible air duct or approved equal. Duct size shall be the same size as the diffuser neck it serves.
- D. Take-offs for sheet metal ductwork shall be made using a spin-in type fitting with air scoop and balancing damper.
- E. Flexible duct connections to ceiling diffusers shall be installed without kinks or sags to provide unrestricted airflow. Provide Flex Flow Elbow supports by Thermaflex.

2.6 DUCT INSULATION

- A. Also refer to Section 15170 - HVAC Insulation.
- B. Supply air ductwork downstream of low pressure air handling equipment shall be internally lined with 1½" thick acoustical duct liner/insulation (minimum R-6 or greater where required by code) Johns Manville Linacoustic RC or approved equal.
 - 1. Duct liner shall be securely fastened to ductwork with stick pins, speed washers and adhesive. Leading edges of liner in medium pressure ductwork shall have a sheetmetal nosing.
 - 2. Exposed edges and butt joints shall be "battered" with duct sealer.
- C. Return air ductwork, sound boots and transfer ducts shall have 1" thick liner, Johns Manville Linacoustic RC or approved equal.

1. Refer to Section 15170 - HVAC Insulation for return air ductwork requiring external insulation.
- D. Round duct liner shall be 1" thick fiberglass duct liner/insulation (minimum R-4 or greater where required by code) Johns Manville Spiracoustic Plus or approved equal.

PART 3 EXECUTION

3.1 DUCTWORK

- A. All ductwork shall be installed in accordance with applicable SMACNA Standards according to the pressure class described in PART 1 - GENERAL.
- B. Ductwork shall be supported as recommended by SMACNA Standards from structural members. Ductwork shall not be allowed to rest on ceilings, light fixtures or structural members. Ductwork supported from joists shall be supported from the top chord of all joists.
- C. All ductwork accessories shall be installed in strict accordance with manufacturer's recommendations.
- D. Ductwork that is designed to operate at static pressures in excess of 3 in. wg and all ductwork located outdoors shall be leak-tested in accordance with SMACNA Standards. Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. All sections shall be selected by the building owner or the designated representative of the building owner. Positive pressure leakage testing is acceptable for negative pressure ductwork. The maximum permitted duct leakage shall be:

$$L_{max} = C_L P^{0.65}$$

where

L_{max} = maximum permitted leakage, cfm/100 ft² duct surface area

C_L = 6, duct leakage class, cfm/100 ft² duct surface area at 1 in. wg

P = test pressure, which shall be equal to the design duct pressure class rating, in. wg

All ductwork seams shall be sealed with mastic to provide a system that is within the recommended SMACNA leakage limits. Six (6) copies of the ductwork test report shall be submitted to the Engineer prior to the Contractor's request for final payment.

- E. All ductwork shall be cleaned inside and out prior to system start up, and shall be left in a neat and orderly manner.
- F. Duct sizes shown on drawings are inside clear dimensions.
- G. Unless otherwise approved, ducts shall be true to dimensions indicated, straight and smooth on the inside with neatly finished joints, securely anchored to the building in an approved manner, and installed to be completely free from vibration under all conditions of operation. Exact routing of ductwork will be dependent on location of framing members. Route ductwork to avoid cutting framing members.
- H. Brace ducts not more than 60 inches on center.
- I. Make slip joints in the direction of air flow.
- J. Offset ducts around obstructions where possible. Where duct must encompass obstruction, area of duct shall remain constant.
- K. Duct tapers shall not exceed 1:4 ratio and transformations 30 degrees between air flow and diverging or converging air flow.
- L. Provide access doors for access to all equipment, dampers and motors concealed by sheet metal.
- M. Where applicable, provide seismic bracing and restraints for ductwork per ASCE 7-10 and the latest edition of the SMACNA Seismic Restraint Manual. Also refer to Section 15051 Noise and Vibration Control.

3.2 BALANCING DAMPERS

- A. Install manual volume dampers where indicated on the drawings and where required to properly balance the air distribution system.
- B. Provide an opposed blade damper behind the face of each supply register which shall be adjustable through the face of the register with a screwdriver.
- C. Provide a butterfly damper in the neck of each supply diffuser unless noted otherwise.

END OF SECTION

SECTION 15030

LOUVERS, GRILLES, REGISTERS AND DIFFUSERS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish and install all louvers, grilles, registers and diffusers of the size, type, capacity, and characteristics as shown on the equipment schedules and described herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

PART 2 PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

- A. Units shall be of the type, size, and construction as scheduled on the Drawings.
- B. Unless otherwise noted on the Drawings, all units shall be supplied with a factory finish of white baked enamel.
- C. Grilles, registers and diffusers shall be ordered with borders compatible with the ceiling system type in which they are installed.
- D. Aluminum devices shall be used for all areas subject to excessive moisture or humidity (e.g. showers, pools, bathrooms, etc.).

PART 3 EXECUTIONS

3.1 GRILLES, REGISTERS AND DIFFUSERS

- A. All units located in ceiling tiles shall be centered or shall be on quarter points of 2 ft. x 2 ft. tiles.
- B. Where a line of sight allows the ductwork, wall or ceiling structure to be seen behind any units, such ductwork, wall or ceiling structure shall be painted with nonflammable flat black paint to minimize visibility.
- C. All units not installed on T-bar ceiling grids shall be securely fastened to adjacent structures.
- D. Where air distribution devices are installed in inaccessible ceilings, provide spin-in with scoop without volume damper. Provide opposed blade damper in neck of air distribution device with access to damper control through face.

END OF SECTION

SECTION 15060

REFRIGERANT PIPING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish and install all materials, labor, accessories, etc. shown on the Drawings and specified herein to completely install all piping systems.
- B. Refrigerant piping shall meet the requirements of the Safety Standard for Refrigeration Systems (ANSI/ASHRAE Standard 15-Latest Edition) and the Code for Pressure Piping (ANSI/ASME Standard B31.5-Latest Edition: Refrigeration Piping and Heat Transfer Components).

1.2 RELATED DOCUMENTS

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

1.3 RELATED REFERENCES

- A. Designation and Safety Classification of Refrigerants (ANSI/ASHRAE Standard 34-Latest Edition).

PART 2 PRODUCTS

2.1 REFRIGERANT PIPING

- A. All refrigerant piping shall be sized and installed in strict accordance with the manufacturer's recommendations.
- B. Piping shall be:
 - 1. Type "L" hard drawn seamless copper tube conforming to ASTM B88, or
 - 2. Type "ACR" (Air Conditioning Refrigeration) service copper tubing conforming to ASTM B280.
 - a. Annealed coils shall be dehydrated, purged with Nitrogen and tightly capped to insure cleanliness. Piping shall be engineered and constructed to support R-410A to 700 psi @ 250°F.
- C. Fittings shall be wrought copper conforming to ASME/ANSI Standard B16.
- D. Joints shall be brazed. Brazing filler metals shall comply with AWS A5.8.
- E. Valves, filter-driers and other accessories shall be suitable for refrigerant service.

2.2 INSULATION

- A. Refrigerant piping shall be insulated with flexible elastomeric tubing insulation, AP Armaflex Pipe Insulation manufactured by Armacel or equal. Where possible, insulation shall be slid over piping from one end before pipe ends are joined and shall not be slit or cut. All joints and seams shall be sealed weather-tight.
- B. Finish coat for flexible elastomeric insulation installed outdoors shall be water-based latex enamel designed for use over all forms of flexible elastomeric insulation. Finish coat shall provide a protective finish suitable to both indoor and outdoor applications, formulated for cold weather flexibility to resist cracking and weather-resistant to ultraviolet (UV) and ozone. Coating shall be Armaflex WB Finish or equivalent.

PART 3 EXECUTION

3.1 GENERAL

- A. Refrigerant piping shall be supported as shown on the Drawings and as required at intervals not over 8'-0" O.C. and at all turns and offsets. Hangers and pipe clamps shall be copper plated tubing hangers of adequate size to fit around tubing and insulation as required. Saddles shall be used under insulated tubing to protect insulation. Piping routed in excess of 6 (six) lineal feet on the roof shall be supported by B-Line "Dura-Blok" rooftop supports or approved equal.
- B. Pressure testing of piping systems shall be in accordance with standard industry practice for the refrigerant used.
- C. Refrigerant piping shall be clean and free of outside contaminants at all times. Prior to start-up of any equipment or insulation installation, all piping shall be cleaned, tested, dehydrated and charged as recommended by the refrigerant compressor manufacturer.
 - 1. Procedure: Joints and connections in refrigerant piping shall not be installed in partitions or walls or where inaccessible for testing, inspection and rework. Make provisions to prevent contact of dissimilar metals. During construction, cap all tubing to prevent moisture from entering. Keep in dry location.
 - 2. Leak testing and recharging: Upon completion of installation of air conditioning equipment, test all refrigerant piping, components and accessories, including quick-connect refrigerant connectors for evaporator and condensing unit; test with a halide torch; prove tight by Contractor to assure a leak-tight refrigerant system. If leaks are detected at the time of installation or during warranty period, remove entire refrigerant charge from system, correct leaks, and retest system. After system is found to be leak free, evacuation shall be accomplished by use of a reliable gauge and a vacuum pump capable of pulling vacuum of at least one mm Hg absolute. Accomplish system evacuation in strict accordance with equipment manufacturer's printed instruction. System leak testing, evacuation, dehydration and charging with refrigerant shall comply with standard industry practice and local codes and ordinances.
- D. All joints in refrigerant piping shall be made accessible. Joints shall not be permitted below concrete.
- E. Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps or shall be otherwise secured to prevent unauthorized access.
- F. All piping shall be run true to grade and shall be arranged to make the best possible appearance. Except where otherwise required by conditions of installation, all piping shall be symmetrical and parallel with lines of buildings or structure in which it is installed. All piping shall be run concealed except in mechanical room and where indicated otherwise.
- G. All piping and equipment shall be supported and guided. Anchors shall be provided to absorb or transmit thrust and eliminate vibration or pulsation. Hangers or supports shall be provided near each change of direction. Supports shall be so located or shall be of such type as not to unduly restrict the movement of the pipe due to lateral or longitudinal expansion.

END OF SECTION

SECTION 15125

PACKAGED ROOFTOP HEATING AND VENTILATING UNITS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish and install all packaged rooftop heating and ventilating units of the size, type, capacity and characteristics as shown on the equipment schedules and herein described.
- B. Equipment schedules and specifications are based on the one manufacturer listed on the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

PART 2 PRODUCTS

2.1 FANS

- A. Fans and Motors: Blowers shall be forward-curved, centrifugal, belt-driven type capable of delivering the air quantities scheduled on the Drawings. Motor pulley shall be adjustable pitch. Indoor blower motor shall have permanently lubricated bearings.

2.2 CABINET

- A. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a baked enamel finish. Cabinet interior shall be insulated with 1" thick insulation. Cabinet panels shall be easily removable for service to all operating components. Cabinet shall have curb, cap and downturn plenum. Cabinet shall have filter rack for 1" thick throw-away filters and 100% outdoor air intake hood.

2.3 CONTROLS

- A. Heating controls shall consist of an electronic modulating gas valve with remote thermostat controller, intermittent pilot ignition, remote pilot flame sensor, limit switches and centrifugal switch.
- B. Dry bulb enthalpy controller economizer cycle with minimum position rheostat including dampers with modulating controllers and spring return operators. A CO₂ sensor shall also be provided in return air duct. The CO₂ sensor shall be wired back to the rooftop unit economizer such that on a CO₂ level rise the outside air damper shall go fully open until the CO₂ level returns below setpoint which shall return the outside air damper back to normal operation. The CO₂ sensor manufacturer shall be the same as the rooftop unit manufacturer.

2.4 HEAT EXCHANGER

- A. Heat exchanger shall be tubular in design and constructed of corrosion-resistant aluminized steel. Heat exchanger shall carry a 5-year warranty and an extended 10-year warranty at additional cost. Burners shall be constructed of stainless steel and be of the slotted-port type.

2.5 ELECTRICAL

- A. Unit Electrical Connections: Cabinet shall contain suitable openings for routing of all utility connections. The base unit shall contain a terminal strip in the control compartment to allow for terminal-to-terminal connection of room thermostat and field-installed accessories.

2.6 REQUIREMENTS

- A. Requirements: Units shall be combination cooling/heating, factory self-contained air conditioning units complete with all necessary factory-furnished controls and dampers. Units shall be complete with the following:
1. Resiliently mounted hermetic compressor with crankcase heaters
 2. High and low pressure switch.
 3. Time "OFF" cycle to prevent short-cycling.
 4. Overload protection and automatic resetting pressure relief.
 5. Aluminum fin, seamless copper tube, evaporator and condenser coils.
 6. Direct drive axial flow condenser fan.
 7. Adjustable speed belt driven centrifugal evaporator blowers.
 8. Heat exchangers
 9. All safety and standard operating controls.
 10. Electric ignition on gas furnace
 11. Factory painted galvanized steel cabinet with interior cabinet insulation.
 12. Factory painted galvanized steel mounting plate attached to cabinet for disconnect switch.
 13. Automatic outdoor air damper.
 14. Combination single or two-stage cooling.
 15. Two state thermostat.
 16. Smoke detectors.
 17. Insulated sheet metal roof curb.
 18. Time Guard.
 19. Filters: Furnish each unit with two (2) inch thickness temporary throw away filters which shall remain in the unit during construction until final acceptance by the Owner. After acceptance by the Owner, the temporary air filters shall be removed and replaced with two (2) inch minimum thickness new throw-away filters.
- B. Units: Rooftop units shall be as listed in schedule on drawings.

PART 3 EXECUTION

3.1 GENERAL

- A. Unit shall be installed in strict accordance with manufacturer's recommendations with clean filters prior to test and balance.

END OF SECTION

SECTION 15150

AUTOMATIC CONTROLS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15000 - HVAC General.
- B. Furnish and install a complete system of automatic controls of the type and characteristics and which will perform the functions described herein and on the Drawings.
- C. All equipment, labor, tubing, etc. required to accomplish the control sequences outlined in this section shall be furnished as part of the HVAC work.
- D. All other HVAC equipment purchased and installed as described in other sections of these specifications shall be coordinated with the requirements of this section to assure compatibility and function.
- E. All electrical control wiring required as part of this work shall be furnished and installed as part of the HVAC work and shall be installed in accordance with Division 16.
- F. This section generally describes the desired operating sequence and characteristics of all HVAC systems provided and installed as part of Division 15 of these specifications. The preparation of the detailed control schematics necessary to accomplish the desired systems operation shall be included as part of the HVAC work. Six (6) copies of these control schematics shall be submitted and reviewed by the Engineer as part of the Shop Drawings prior to the purchase or installation of any control equipment or other equipment that depends on these control schemes for proper operation.
- G. All major control equipment shall be located in a suitable enclosure in the mechanical room.

1.2 CODES AND REFERENCES

- A. National Fire Protection Association – 90A, 90B, 92
- B. ASHRAE Standards

1.3 MANUFACTURERS

- A. Acceptable manufacturers/installers for automatic controls: Trane, or approved equal.

PART 2 PRODUCTS

2.1 GENERAL

- A. Only those products of particular importance to appearance or function are described in this Products section. Other items required for satisfactory systems operation but not herein described shall be furnished and installed to meet the intent and Operating Sequences herein described.

2.2 AUTOMATIC SHUTDOWN OF RECIRCULATING AIR SYSTEMS

- A. All fans supplying more than 2,000 cfm of air to any space and all recirculating fan systems serving areas of egress shall be installed with a smoke detector in the return ductwork. Duct smoke detectors shall be installed in the return air path of air distribution systems utilizing a common supply and/or return air plenum with a combined design capacity greater than 2,000 cfm.
- B. The smoke detector shall be wired to stop the fan upon detection of smoke, and signal the building fire alarm control panel. The smoke detector shall be furnished by the Electrical Contractor, mounted in the duct by the HVAC Contractor, and wired by the Electrical Contractor.

- C. The smoke detector shall cause a visible and audible alarm signal in a normally occupied area. Smoke detector trouble conditions shall be identified as air duct detector trouble. The smoke detector and audible/visible alarm shall be furnished and installed by the HVAC Contractor.

2.3 HVAC EMERGENCY SHUTDOWN

- A. Manual over-ride control (emergency shut-down) switch for all HVAC units shall be located in a locking cover adjacent to the fire alarm annunciator panel or other location approved by the authority having jurisdiction.
- B. Provide motor starter(s) with auxiliary contactor to accomplish Item A above.

PART 3 EXECUTION

3.1 OPERATING SEQUENCE

- A. All units and systems shall be controlled as described on the Drawings and as recommended by equipment manufacturers.
- B. RTU SEQUENCE OF OPERATIONS:
 - 1. General: Provide factory mounted and wired microprocessor based controls. Provide any field supplied devices to complete this sequence of operation. Install any RTU manufacture supplied devices to complete this sequence of operation. Occupied/Unoccupied mode for the rooftop unit from Owner defined schedule.
 - 2. Unoccupied Mode: Unit fans, heat, and refrigeration will be de-energized, and the outside air damper will be closed. When the zone associated with a particular unit fall outside of the unoccupied mode temperature range (60°F to 85°F-adjustable), the unit fan will be energized and controlled as described below. The unit outside air damper shall remain closed and exhaust fan shall remain de-energized, unless cooling is called for and economizer operation is available. The unit shall be de-energized once all zones are within the unoccupied mode temperature range
 - a. Unoccupied Heating Mode: If the zone temperatures are below the unoccupied mode range, all zone air terminals' control sequence shall be changed to reverse acting (see below), and the unit discharge air temperature will be controlled to 95°F (adjustable) by modulating the gas furnace.
 - b. Unoccupied Cooling Mode: If the zone temperatures are above the range, the unit discharge air temperature will be controlled to 55°F (adjustable) by staging on DX cooling and economizer. Unit packaged controls shall use economizer mode for first stage of cooling if conditions are appropriate.
 - 3. RTU Start-up: Upon initiating start-up, either by the optimized start-up routine, or from a request for unoccupied mode override at a sensor, the zone temperature setpoint range shall be reset to occupied mode, and the unit fan shall be energized and control as described for Occupied Mode. The unit outside air dampers shall remain closed and relief fans are de-energized, unless cooling is called for and economizer operation is available. Once scheduled building occupancy time is reached, outside air dampers and relief fans are enabled.
 - 4. Minimum Outside Air Damper Control: Once the fans are proven on, the minimum outdoor air damper will modulate to maintain a constant outside air quantity as measured by unit's outside air sensor.
 - 5. Supply Air Temperature Setpoint - Optimized: The controller shall monitor the supply air temperature and shall modulate the gas fired furnace, or stage on DX cooling to maintain a supply air temperature setpoint reset based on zone cooling requirements, and to minimize terminal unit electric heat operation. Cooling

demand may be measured by a combination of air terminal damper position and variance from space setpoint, or other method as proposed by the Contractor and approved by the Engineer.

a. The supply air temperature setpoint shall be reset based on zone cooling requirements as follows:

1) The initial supply air temperature setpoint shall be 56°F (adj.).

6. Economizer Control: If the outdoor air temperature is 5 Deg F (adjustable) or more, below return air temperature, the mixed air dampers will modulate to maintain discharge air temperature set point. DX cooling shall be allowed to operate during economizer operation, once the outside air dampers have opened fully.

7. Smoke Detection Control: Upon detection of smoke from the return or supply duct smoke detector, the fans will cycle off, and the outdoor air dampers close. Once the detectors are reset, the unit will return to normal control.

8. Filter Status: Monitor pressure switch at filter bank, and alarm when Δp increases above .80" wg (adjustable).

C. EXHAUST FAN SEQUENCES

1. General exhaust fans shall operate on an adjustable 7-day Time-of-Day schedule. Fans shall be scheduled to operate with building occupancy.

D. HEATER SEQUENCES

1. Outdoor Overhead Infrared

a. Infrared heaters shall be controlled by manual switch control located in the manager's office.

2. Baseboard heaters

a. Baseboard heater shall be controlled by integral thermostat. Thermostat shall be set by owner/manager.

3. Ceiling Mounted Heater (In Vestibule)

a. Heater shall be controlled by remote thermostat located in the manager's office. Sensor shall be located within vestibule.

4. Unit Heater

a. Heater shall operate when thermostat, integral or located as shown on plans, senses temperature is below 50°F (Adjustable).

END OF SECTION

SECTION 15170

HVAC INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15000 - HVAC General.
- B. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification section 01 81 16: Facility Environmental Requirements.

1.2 WORK INCLUDED

- A. The work done under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install all insulation, complete, as indicated on the Drawings and as specified herein.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials as specified in this section shall be manufactured by Armstrong, Johns-Manville, Knauf, Pittsburgh-Corning, Certainteed, Pabco, Dow Chemical, Owens Corning or approved equal.
- B. Insulation thicknesses shall be as shown in the following table:

Minimum Pipe Insulation			Insulation Thickness for Pipe Sizes					
Piping System Types	Fluid Temperature Range		Runouts 2 in. + In.	1 in. and Less In.	1-1/4 to 2 in. In.	2-1/2 to 4 in. In.	5 and 6 in. In.	8 in. and Larger In.
	°C	°F						
(Cooling Systems)								
Chilled Water*, Geothermal Heat Pump Loop, Condensate	4.5-13	40-55	1.0	1.0	1.5	1.5	1.5	1.5
Refrigerant or Brine	Below 4.5	Below 40	1.5	1.5	1.5	1.5	1.5	1.5
+ Runouts to Individual Terminal Units (not exceeding 12 ft. in length)								
* For chilled water piping located in attics and other unconditioned spaces (excluding return air plenums), increase the pipe insulation thickness by 1/2" for pipe sizes up through 8". Insulation for piping 10" and larger shall be 2-1/2" thick.								

- C. Ductwork
 - 1. All supply air ducts with heated or cooled air shall be insulated. All return ducts in concealed and unheated areas shall be insulated.
 - 2. Toilet and general exhaust ductwork exhausting air conditioned air and routed in attic spaces shall be insulated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Shop drawing submittals shall include a complete package of materials and methods intended for use as described in this section.
- B. All work shall be in strict accordance with applicable codes, ordinances and the manufacturer's recommendations.
- C. All work shall be performed in a professional workmanlike manner and standard trade practice. It shall be smooth in appearance and suitable for finish painting.

END OF SECTION

SECTION 15180

KITCHEN VENTILATION EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish and install a self-compensating ventilation canopy over the cooking battery complete with makeup and exhaust fans with curbs, grease filters, dry chemical fire suppression system, vapor-proof lights and controls.

PART 2 PRODUCTS

2.1 KITCHEN HOOD VENTILATION AND EXHAUST SYSTEM

- A. Description: Hood over food cooking equipment shall provide for both air supply and air exhaust. Supply air provided through blower with filters directly from outside. Exhaust air pulled through "grease" extractor filters and discharged vertically above the roof. Provided by kitchen consultant. Refer to the Drawings for model, size and capacities.

2.2 EXHAUST CANOPY FIRE PROTECTION SYSTEM

- A. Shall be provided by the kitchen consultant.
- B. The fire suppression protection system should be of the stored pressure, wet chemical pre-engineered fixed nozzle type.

2.3 SUPPLY AND EXHAUST DUCT

- A. Furnish and install supply and exhaust ductwork in accordance with the latest edition of NFPA 96 and all applicable local codes.
- B. Exhaust ductwork shall be constructed of black steel minimum of 16-gauge thickness. All seams, joints, and penetrations shall have a continuous external weld except where the exhaust duct is connected to the exhaust canopy collar. Connection to the exhaust canopy collar shall be constructed in accordance with NFPA 96.

2.4 ROOFTOP MAKEUP AIR FAN

- A. Provide air supply utility set of the single inlet, single width type. Fan housing shall be constructed of heavy gauge galvanized steel with weatherproof coating. Fan shall be provided with weather housing.
- B. Fan wheel shall be aluminum, backwards inclined non-overloading. Fan shall be complete with adjustable belt drives, motor and disconnect switch.
- C. Provide fan with filter hood for use with 2" thick cleanable filters complete with hood support frame, roof curb adapter for use in the downblast arrangement, backdraft damper and birdscreen.

2.5 ROOFTOP CENTRIFUGAL UPBLAST EXHAUST

- A. Provide UL Listed upblast centrifugal fan of aluminum construction complete with non-sparking centrifugal fan wheel.
- B. Fan shall come complete with motor and adjustable belt drive, disconnect switch, birdscreen, grease trough, and hinged base (for cleaning).
- C. Fan and installation shall comply with NFPA 96.
- D. Motor, bearings, and drive shall be isolated from exhaust air. Motor shall be cooled by clean outside air.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 15605

ELECTRIC WALL HEATERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15000 - HVAC General.

1.2 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install wall heaters complete as indicated on the Drawings and as specified herein.

PART 2 PRODUCTS

2.1 WALL HEATERS

- A. Unit shall be UL Listed, completely factory assembled, wired, tested and shipped as a single assembly. Capacity shall be as indicated on the Drawings.
- B. Front grille shall be 16-gauge steel or aluminum finished in baked enamel or anodized with downflow discharge louvers.
- C. Element shall consist of helically coiled nickel chromium alloy resistance wire enclosed in corrosion resistant sheaths.
- D. Controls shall include fan delay switch, built-in thermostat, automatic reset thermal overload switch and a non-fused disconnect power switch.
- E. Unit shall be designed to either recess into the wall or for surface mounting as scheduled, and shall include all mounting accessories.
- F. Unit shall be Q-Mark, Markel or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All units shall be installed in strict accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 15606

ELECTRIC UNIT HEATERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15000 - HVAC General.

1.2 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install electric unit heaters complete as indicated on the Drawings and as specified herein.

PART 2 - PRODUCTS

2.1 UNIT HEATERS

- A. Unit shall be of the horizontal or vertical blow-thru propeller fan type.
- B. Casing shall be constructed of 18-gauge die-formed, furniture grade steel, phosphate coated and finished in baked enamel.
- C. Electric heating element shall be a resistant wire enclosed in a steel sheath with fins.
- D. Fan shall be direct drive, propeller type, designed for unit heater application.
- E. Motor shall be totally enclosed, thermally protected continuous duty selected to match fan requirements.
- F. Unit shall be provided with the manufacturer's standard mounting bracket for either ceiling or wall mounting as required.
- G. Unit shall be equipped with individual adjustable louvers.
- H. Wiring of unit heater shall be designed for a single source power connection with elements, motor and control circuits subdivided and fused to conform to the latest National Electrical Code, OSHA and Underwriters Laboratories Inc. standards. All three phase heaters shall have balanced phases. A non-fused disconnect switch factory wired shall be provided. Control circuit voltage shall not exceed 120 volts.
- I. Unit heater shall be equipped with an automatic reset linear thermal cut-out, a fan delay switch, control circuit transformer and either a wall mounted or unit mounted thermostat as shown on the Drawings.
- J. Units shall be Q-Mark, Markel, Trane, Modine or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All units shall be installed in strict accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 15660

MISCELLANEOUS HVAC EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish and install the equipment as specified below. The manufacturer shall have available factory trained service engineers and an inventory of replacement parts within a one hundred mile radius of the job site.

PART 2 PRODUCTS

2.1 ELECTRIC BASEBOARD HEATERS

- A. Heaters shall be low profile and available in lengths compatible with mullion spacing.
- B. Enclosures shall be 14-gauge, furniture quality steel or 12-gauge aluminum with reinforced, all welded, construction; designed to withstand heavy-duty commercial and institutional use.
- C. Enclosures shall be chemically-treated to resist corrosion. Finish shall be mar and temperature-resistant.
- D. Heating elements shall be constructed of nickel-chromium. Multiple, low density elements shall be installed side-by-side on the same plane to uniformly warm all incoming air. Elements shall be center-anchored and shall float freely on each end through nylon bushings.
- E. Units shall be available with front inlet and top discharge for mounting flush with floor, or with bottom inlet and top discharge for mounting with wall above floor. Front inlet and top discharge grilles shall be extruded aluminum with anodized finish. Heaters shall be designed so that front covers can be easily removed for individual servicing in a wall-to-wall run.
- F. A 1/4" mesh screen shall be installed beneath the discharge grille to deter the insertion of foreign objects.
- G. Built-in controls shall include single-pole, double-pole, or two-stage thermostats, disconnect switch, transformer relay and power relay. The thermostats shall be capable of controlling multiple units on a pilot duty circuit. Thermostat adjustment shall be with a thin-bladed screwdriver through the discharge louvers and shall be considered tamper-resistant.
- H. An automatic reset thermal overheat protector shall run the full length of the heater and shall turn off heating elements should overheating occur at any point along heating length. Overheat protector shall restore operation automatically when cause of overheating is removed.
- I. Heaters and blank sections shall be designed so they can be butted together with use of splice plates.
- J. Heaters shall be designed with built-in-pre-wired raceway to enable multiple-unit wiring from one feeder source.
- K. Back panel shall be one-piece painted steel, completely finished, and shall be suitable for mullion-to-mullion mounting in front of glass curtain wall.
- L. All heaters and electrical accessories shall be labeled by Underwriters Laboratories Inc.
- M. Heaters shall be equal to Q-Mark Architectural Convection Heater.

2.2 ELECTRIC HEATERS IN CEILING

- A. Heaters shall be surface mounted semi-recessed as scheduled and be of tamper resistant construction.
- B. Enclosures shall be 20-gauge, furniture quality steel construction; designed to withstand heavy-duty commercial and institutional use.

- C. Enclosures shall be chemically-treated to resist corrosion. Finish shall be marr and temperature-resistant.
- D. Heating elements shall be constructed of steel finned metal sheath heating elements with low sheath temperatures to provide uniform heat.
- E. Integral thermostat, tamper resistant.
- F. Automatic reset thermal overhear protection.
- G. Built-in fan delay switch to energize fan only after elements are heated.
- H. All heaters and electrical accessories shall be labeled by Underwriters Laboratories Inc.
- I. Heaters shall be by Q-Mark or approved equal.

2.3 MAKE-UP AIR UNIT

- A. Provide gas-fired rooftop heating and ventilating furnace(s) as shown on the plans. Each unit shall be AGA certified and have the following factory supplied components:
 1. Screened 100% outside air inlet hood with internal air baffles.
 2. Spark ignited, recycling (interrupted) pilot with electronic flame supervision.
 3. Type 409 (E-3) stainless steel heat exchanger and burners.
 4. Motor, starter, and adjustable drive to meet voltage, air flow, external static pressure, and filter requirements scheduled on plans.
 5. Filter rack for filters. Furnish disposable filters with unit to be replaced with filters specified when project is completed.
 6. Integral power venting with air flow proving switch.
 7. Modulating or multistage gas valve with adjustable duct discharge air temperature control and room override thermostat.
 8. Outside air dampers with -40 degree ambient damper motor interlocked with unit fan.
 9. Blower and filter cabinet insulation.
 10. Weatherproof fused external electrical disconnect.
 11. Factory engraved remote control panel with 24 volt room thermostat mounted on panel. Heat/Vent/Off switch and indicator lights for blower, burner, and dirty filter.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in strict conformance with manufacturer's installation instructions.

END OF SECTION

SECTION 15855

ROOF CURBS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15000 - HVAC General.

1.2 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work included under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install curbs complete as indicated on the Drawings and as specified herein.

PART 2 PRODUCTS

2.1 GENERAL

- A. Prefabricated curbs for HVAC equipment located on the roof shall be manufactured by Custom Curb, Inc., Pate, Thycurb, Roof Products and Systems, Inc., or approved equal.

2.2 ROOF CURBS

- A. Coordinate size of roof curb with air unit manufacturer.
- B. Curbs shall be Series CRC-3 fabricated to match any roof slope and have a minimum height of 16". Coordinate with the roof system used so that a minimum of 8" of the curb is above the finished roof for flashing purposes. The top of the curb shall be level and the slope of the roof shall be compensated for by the curb.
- C. Curbs shall be a minimum of 18-gauge galvanized steel construction (or as deemed necessary by the curb manufacturer to support unit load) with fully mitered and welded corners and self-flashing without cant. The curb shall not sag more than 1" in 240" + or - when supporting the unit at the corners of curb only. The curb shall be internally reinforced with angle iron, factory insulated with 1-1/2", 3 lb. density fiberglass insulation, and shall be complete with factory installed pressure treated wood nailers. Coordinate sizes to match frames provided by others. When the project is located within 5 miles of a sea coast, curbs shall be of aluminum construction.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's printed instructions and as detailed on the Drawings. Curb manufacturer shall coordinate with HVAC and General Contractor.

END OF SECTION

SECTION 15911

FIRE-RESISTIVE 3M FIREMASTER® DUCT WRAP

PART 1 GENERAL

1.1 SUMMARY

- A. Work of this section includes labor, material, and equipment to provide 2-hour fire-resistive rated grease or air duct enclosure as a shaft alternative and a method for providing 0" clearances around commercial kitchen grease duct exhaust systems to combustible materials.

1.2 REFERENCES

- A. Test standards and reports for evaluating and rating performance of fire-resistive shaft alternative enclosures and 0" clearance duct wrap systems:
 - 1. Underwriters Laboratories Inc. (UL)
 - a. UL 723, surface burning characteristics per ASTM E84: File R8418, December 11, 1992; File R9464; File R9063
 - b. UL 1978, First Edition Standard for Grease Ducts, File R14229
 - c. UL 1479, Through-Penetration 3-Hour Firestop Test, File R14229
 - d. Underwriters Laboratories of Canada, ISO 6944-1985, 1- and 2-Hour Large Ventilation Duct Fire-Resistive Enclosure Test
 - e. Underwriters Laboratories of Canada CAN4-S115-M85/UL1479, 1 and 2-Hour Through-Penetration Firestop Tests
 - f. Fire Protection Equipment Directory, YYET, R14229
 - g. Fire-Resistive Directory, Vol II, File R8418, CAJ7009
 - h. Building Materials Directory, File R8418
 - i. Building Materials Directory, AWWN, R9700
 - j. Fire-Resistive Directory, Vol II, File R14229, CAJ7013, CAJ7015, CAJ7020, CAJ7022
 - k. Underwriters Laboratories of Canada, ULC S102-M88, flammability
 - 2. American Society for Testing and Materials (ASTM)
 - a. E119, Standard Method of Fire Tests of Building Construction and Materials; 2-Hour Wall Panel Test, and 2-Hour External Total Engulfment Test
 - b. E814, Standard Method of Fire Tests of Through-Penetration Fire Stops; 2-Hour Firestop Tests
 - c. E136, Combustibility Test
 - 3. NFPA 96, 1994 Edition, Ventilation Control & Fire Protection of Commercial Cooking Operations
 - 4. Lehigh Laboratories, USAEC Reg. Guide 1.36
 - 5. US Department of Transportation (DOT)
 - a. DOT-HM-144
 - b. DOT-HM-175

1.3 SYSTEM DESCRIPTION

- A. A lightweight, non-asbestos, high temperature inorganic ceramic fiber blanket totally encapsulated in foil/scrim having a service temperature range up to 2,300 degrees F. FireMaster® Duct Wrap is directly applied to commercial grease hood duct systems and air duct systems to allow a 0" clearance to combustible construction and to provide a 2-hour fire-resistive duct enclosure. FireMaster® Duct Wrap, in conjunction with CAJ7013, CAJ7015, CAJ7020, or CAJ7022 through penetration firestop system is an alternative to rigid shaft enclosures. FireMaster® Duct Wrap is applied in a continuous wrap from the point the duct enters a concealed space to its exit from a building.

- B. Performance Requirements
 - 1. 2-hour rated fire-resistive enclosure assembly, ASTM E119: Large scale Wall Panel Test and Total Engulfment Test
 - 2. 0" clearance to combustible, maximum allowable surface temperature on unexposed side, UL 1978
 - 3. Class I interior finish materials, ASTM E84
 - 4. Through-penetration protection systems for grease and air ducts, ASTM E814 and UL 1479
 - 5. Non-Combustibility, ASTM E136
 - 6. ISO-6944-1985, Fire Resistance Tests - Ventilation Ducts
- 1.4 SUBMITTALS
 - A. Submit test reports substantiating performance requirements and code compliance along with manufacturer's installation instructions.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver materials in original sealed containers or unopened packages, and clearly labeled with manufacturer's name, product identification, and lot numbers.
 - B. Store materials out of weather and in an enclosed shelter.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Fire-resistive FireMaster® Duct Wrap materials; manufactured by Thermal Ceramics, Augusta, Georgia 30903, distributed by 3M, St. Paul, MN and its authorized distributors.

2.2 MATERIALS

- A. Fire-resistive duct wrap: FireMaster® Duct Wrap, 1.5" thick, 24" or 48" wide x 300" long rolls, foil encapsulated with logo identification. FireMaster® Duct Wrap Collar, 8" wide for air duct butt joint optional wrap method (see Section 3.02, B).
- B. Tapes
 - 1. High performance filament: Tape No. 898, 1" wide, manufactured by 3M Company, St. Paul, MN, or equal and approved
 - 2. Aluminum foil tape: Minimum 3" wide to seal cut blanket edges
- C. Banding Material
 - 1. Carbon steel banding for 1-hour ratings; 3/4" wide x 0.015" thick minimum
 - 2. 304 Stainless steel banding for 2-hour ratings; 3/4" wide x 0.015" thick minimum
- D. Insulation Pins/Washers
 - 1. Pins: 10-gauge, 4" to 5" long, copper coated steel; washers: 1.5" x 1.5" or 1.5" diameter galvanized steel speed clip
- E. Through-Penetration Fire Stop Materials
 - 1. Packing Material: Scrap pieces, FireMaster® Duct Wrap, 1.5" thick or 3 pcf mineral wool as packing material
 - 2. 3M FB-2000+Silicone or FireMaster® Putty, ceramic fiber based sealant
- F. Grease Duct Access Door
 - 1. Steel angle opening frame
 - 2. Access Cover, minimum 16-gauge
 - 3. Insulation Pins
 - 4. Speed Clips, minimum 1.5" x 1.5" or 1.5" diameter galvanized steel
- G. Hardware
 - 1. Threaded rods: 4" to 5" long, 1/4" diameter galvanized steel with 1/4" wing nuts and 1/4" metal washers
 - 2. 4" long steel hollow tubing to fit threaded rods

3. 1/4" wing nuts

PART 3 EXECUTION

3.1 PREPARATION

- A. Remove dirt and dust, and clean surfaces of openings and items penetrating rated floors and rated walls.

3.2 INSTALLATION

- A. Install FireMaster® Duct Wrap system in accordance with manufacturer's instructions and referenced standards.
- B. Install FireMaster® Duct Wrap in direct contact with the duct it encloses. Protect every portion of duct with no less than two (2) layers for grease duct applications and one (1) layer for 1-hour air duct enclosures and two (2) layers for 2-hour air duct enclosures. Overlap both perimeter and longitudinal joints minimum 3" per layer of material.
 1. Air Duct Enclosure Optional Wrap: Follow same traditional wrap method with exception of utilizing a 3" perimeter overlap in conjunction with longitudinal butt joint wrap plus FireMaster® Duct Wrap Collar over exterior layer joints. Filament tape is used as temporary hold on both layers until banding hardware is in place. Band exterior layer spaced minimum 10-1/2" on center. For duct widths greater than 24", weld insulation pins to bottom horizontal and outer vertical duct runs. Impale FireMaster® Duct Wrap over pins and secure with galvanized steel speed clips until banding is applied.
- C. Locate grease duct access doors at horizontal cleanouts as required by local codes. Protect with three (3) layers of FireMaster® Duct Wrap, each layer overlapping previous by 1" on all sides and in accordance with manufacturer's instructions.
- D. Protect floor and wall penetrations with an approved through-penetration system having an F and T hourly rating not less than that of assembly penetrated and installed in accordance with manufacturer's instructions and as follows:
 1. Grease Ducts - 1 or 2-Hour Enclosure: Option A: Two (2) layers of FireMaster® Duct Wrap per manufacturer's installation instructions, maintaining 3" transverse and longitudinal overlaps continuous through the penetration. Option B: Tightly butt FireMaster® Duct Wrap to the floor or wall on both sides of the assembly. Fill remaining annular space (3" maximum) between the wrapped duct (Option A) or bare steel duct (Option B) and periphery of the opening with 4-1/4" thickness of scrap FireMaster® Duct Wrap, or 4-1/4" 3 pcf mineral wool batt, firmly packed into opening. Apply 1/4" minimum 2000+ Silicone over packing material, within the annulus, flush with top surface of floor or both surfaces of wall.
 2. Air Ducts - 1-Hour Enclosure: Option A: One (1) layer FireMaster® Duct Wrap per manufacturer's installation instructions, maintaining 3" transverse and longitudinal overlaps or optional 3" perimeter overlap with longitudinal butt joints plus FireMaster® Duct Wrap Collar over exterior layer joints. Option B: Tightly butt FireMaster® Duct Wrap to the floor or wall on both sides of the assembly. Fill remaining annular space between the wrapped duct (Option A) or bare steel duct (Option B) and periphery of the opening with 4-1/4" thickness of scrap FireMaster® Duct Wrap, or 4-1/4", 3 pcf mineral wool batt firmly packed into opening. Apply 1/4" minimum 2000+ Silicone over packing material within the annulus, flush with top surface of floor or both surfaces of wall.
 3. Air Ducts: 2-Hour Enclosure: Same as 1-hour air duct enclosure system except apply two (2) layers of FireMaster® Duct Wrap per manufacturer's installation instructions.

3.3 REPAIR PROCEDURE

- A. Repair damaged FireMaster® Duct Wrap in accordance with manufacturer's instructions.

- B. Remove damaged section. Apply a new section of same dimension. Place and fit ensuring same overlap that existed previously. Place banding around new FireMaster® Duct Wrap material and tension to sufficiently hold in place.
- C. If damage has penetrated to interior layer, remove affected sections and reinstall as specified in section 3.02 – INSTALLATION of this specification.

END OF SECTION

SECTION 15950

TESTING, ADJUSTING AND BALANCING (TAB)

PART 1 GENERAL

1.1 DESCRIPTION

- A. Refer to specification section 15000 - HVAC General, all of which applies to work described in this section as if written in full herein.
- B. The work described by this section of the specifications consists of furnishing all materials, instruments, labor, and appurtenances to test, adjust and balance all of the HVAC systems furnished and installed under Division 15 of the specifications.
- C. The TAB agency shall be a subcontractor of the General Contractor and shall not report to or be paid by the HVAC Contractor. The HVAC subcontractor shall be responsible to cooperate with and provide for the balancing subcontractor any and all materials, services, labor, etc. to facilitate completion of the balancing work.

1.2 QUALITY ASSURANCE

- A. The TAB agency and its specialist shall be certified members of Associated Air Balance Council (AABC) or certified by the National Environmental Balance Bureau (NEBB) to perform TAB service for HVAC, and vibration and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein. The TAB agency shall have been in business for at least the past five years and must be free of disciplinary action by either the AABC or the NEBB during that time.
- B. All TAB technicians performing actual TAB work shall be experienced and must have done satisfactory work on a minimum of 3 projects comparable in size and complexity of this project and must be certified so by the TAB agency in writing.
- C. The basic instrumentation shall be calibrated to accuracy requirements by its manufacturer, AABC or NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems. Provide calibration history of the instruments to be used for test and balance purpose.
- D. One or more of the applicable AABC, NEBB or SMACNA publications, supplemented by the ASHRAE Handbooks and requirements stated herein shall be the basis for planning, procedures, tolerances and reports. Final report shall cite the exact names of publications used as a basis or reference for the TAB work or reports.

1.3 DEFINITIONS

- A. Retain definition(s) remaining after this Section has been edited.
- B. AABC: Associated Air Balance Council.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An entity engaged to perform TAB Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide plastic plugs to seal holes drilled in ductwork for test purposes.
- B. Provide for repair of insulation removed or damaged for TAB work to match installation.

PART 3 EXECUTION

3.1 TAB PROCEDURES

- A. TAB shall be performed in accordance with the requirements of the Standard under which the TAB agency is certified, either AABC or NEBB.
- B. During TAB all related system components shall be in full operation. Fan rotation, motor loads shall be checked and corrected as necessary before proceeding with TAB. Set controls and/or block off parts of distribution systems to simulate design operation of variable volume air or water systems for test and balance work.
- C. Adjustment of the temperature controls shall be coordinated by the TAB work specialist in conjunction with the Automatic Temperature Control Company's Engineer. Both shall cooperate to simulate a complete cycle for every system in every mode of operation (automatic, economizer, fire emergency, etc.).
- D. Coordinate TAB procedures with any phased construction completion requirements for the project. Provide TAB reports for each phase of the project prior to partial final inspections of each phase of the project.

3.2 AIR SYSTEMS TAB

- A. Systems shall be tested, adjusted and balanced so that air quantities and temperatures at outlets are as shown on the Contract Drawings and so that the distribution from supply outlets is uniform over the face of each outlet.
- B. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but air quantities in ducts having velocities of 1,000 feet per minute or greater shall be measured by means of pitot tubes and inclined gauge manometers. Instrument test opening enclosures shall be provided as required at the direction of the TAB agency.
- C. Adjustments shall be made in such a manner that splitter and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Primary balancing shall be obtained by adjustment of the dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Additional dampers or other air volume adjusters required to accomplish the balancing and adjusting shall be furnished and installed as part of the HVAC work.
- D. Artificially load air filters by partial blanking to produce air pressure drop of at least 90 percent of the design final pressure drop.
- E. Check and readjust factory set minimum and maximum air terminal unit flow rates if necessary. Balance air distribution on full cooling maximum. Reset room thermostats and check operation from maximum to minimum cooling, to the heating mode, and back to cooling. Record and report the heating coil leaving air temperature when in the maximum heating mode.
- F. Adjust fan speeds to provide design air flow. Adjust V-belt drives, including fixed pitch pulley requirements.
- G. After completion of the testing, adjusting and balancing of the air systems, six (6) copies of a recognized complete set of reports showing the minimum following information shall be submitted to the Engineer for review:
 - 1. Systems inspection narrative on equipment and installation for conformance with design
 - 2. Duct Air Leakage Test Report
 - 3. Systems Readiness Report
 - 4. TAB report covering flow balance and adjustments, performance tests, vibration tests and sound tests. Required information:
 - a. Location of each air outlet or inlet. This shall be presented in the form of a reduced size floor plan showing outlet number keyed to the outlet number in the report.
 - b. Dimensions or size of each outlet or inlet
 - c. Type and manufacturer of diffusers, grilles, registers. Indicate duty as supply, return, exhaust, etc.
 - d. Cfm of air as indicated on the Drawings for each outlet or inlet with corresponding velocity

- e. Velocity of air as measured and corresponding cfm at which system has been balanced and adjusted, for each outlet or inlet
 - f. Velocity of air measured and corresponding cfm, after each complete system has been balanced and adjusted, for each main branch or zone duct at the supply fan, the return fan and the exhaust fan, as the case may be
 - g. After each complete system has been balanced and adjusted, the total cfm at fan discharge, the total return air to the apparatus, the total outside air to the apparatus, the total outside air to the apparatus, static pressure at fan outlet, total static pressure for apparatus, fan speed, motor amperage for each phase and voltage
5. Narrative of uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements
- H. The above testing, adjusting and balancing shall be performed for the first season of the year, cooling season or heating season, which occurs at the completion of the building.
 - I. Ventilation air distribution systems (outdoor air and exhaust air) shall be balanced to achieve the airflow rates indicated on the drawings. These airflow rates shall be considered minimum rates. The measured air balance tolerance for both outdoor air and exhaust air rates shall be -0% to +10%.

3.3 MARKING OF SETTINGS AND TEST PORTS

- A. Following the approval of the final TAB Report, the setting of all HVAC adjustment devices including valves, splitters and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time. Style and colors used for markings shall be coordinated with the General Contractor.
- B. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

END OF SECTION

SECTION 16000

ELECTRICAL GENERAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work to be done under this section of the specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of systems for power, lighting, signals and all other work indicated on the drawings or as specified herein. A 100% operational building and electrical distribution system up to a connection point for Owner furnished equipment will be provided.
- C. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both.

1.2 STANDARDS

- A. All work shall conform to all ordinances and regulations of the City, County, State and/or other authorities having jurisdiction in accordance with the requirements of the following codes, standards and design guides:
 - 1. The 2011 edition of the National Electrical Code (NFPA 70)
 - 2. The 2012 edition of the International Building Code
 - 3. The 2009 edition of the Life Safety Code (NFPA 101)
 - 4. ASHRAE 90.1-2007
 - 5. Regulations of the local utility company with respect to metering and service entrance
 - 6. Local city and county ordinances governing electrical work
 - 7. Americans with Disabilities Act (Public Law 101-336)

1.3 PERMITS

- A. The Contractor shall obtain all permits and inspections required for the installation of this work and pay all charges incident thereto. He shall deliver to the Architect all certificates of said inspection.

1.4 WORK INCLUDED

The electrical systems installed and work performed under this division of the specifications shall include but not necessarily be limited to those listed below. All materials and appliances, obviously a part of the electrical systems and necessary to its proper operation, but not specifically mentioned or shown on the drawings, shall be furnished and installed without additional charge.

- A. Power Distribution System
- B. All lighting systems (indoor and outdoor, normal, emergency and exit) including all fixtures, lamps, plaster and/or tile frames, standards, switches, outlets, wiring, dimmers, contactors, time clocks, photocells, batteries, raceways and other components and fittings required for complete lighting systems
- C. Wiring, including power circuit connections for HVAC, plumbing and other mechanical equipment
- D. Grounding Systems
- E. Temporary service lighting and power system
- F. Low voltage system raceways and equipment mounting boards as indicated on the drawings
- G. Underground raceway excavation, backfill, and compaction

- H. Fire Alarm System
- I. Concrete work for duct banks, manholes, covering, lighting standard bases and equipment bases (where not assigned to General Contractor)
- J. Electrical Equipment Identification
- K. Supporting Devices for Electrical Components
- L. Work as required by electric and telecommunication utilities, as well as the coordination of additional work (i.e. work performed by the utility) with that of other trades

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and show the arrangement and location of fixtures, equipment and conduit. The Contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to rearrange conduit or equipment, the Contractor shall so advise the Engineer and secure approval before proceeding with such work.
- B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.
- C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.
- D. Locate pull boxes, panelboards, control pushbuttons, terminal cabinets, safety switches and such other apparatus as may require periodic maintenance, operation, or inspection, so that they are easily accessible. If such items are shown on the plans in locations which are found to be inaccessible, the Engineer must be advised of the situation before work is advanced to the point where extra costs will be involved.
- E. All additional circuit connections to panelboards must be preapproved by the Engineer.
- F. The location, arrangement and extent of equipment, devices, conduit, and other appurtenances related to the installation of electrical work shown on drawings are approximate. The Contractor shall not scale drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy.
- G. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering lighting fixtures. Notify the Engineer of any discrepancies.
- H. Review all architectural drawings for door swings, cabinets, counters and built-in equipment.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall prepare a minimum of two (2) instruction manuals, one of which shall be submitted to the Architect for the Engineer's review, describing installation, operation and maintenance of all Electrical equipment. Manuals shall include copies of control schematics, sequences of operation, indicate the function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturer's drawings, pamphlets, data, parts lists, and instruction manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in a 3-ring binder(s).

1.7 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. After all work is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the Contract Drawings that

reflect all changes and that accurately show actual final construction, and deliver these drawings to the Architect.

1.8 EQUIPMENT, MATERIALS AND BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment names in specifications or on drawings as "base" products.
- C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be substantially equal in size, weight, construction and capacities. The "equal" equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. Submittals for "equal" products shall be made at least ten (10) days prior to bid (refer to the General Conditions of these specifications). The Engineer shall consider the use of the "equal" equipment based on the supportive documentation available to him, and shall approve or disapprove any proposed alternates. The decision of the Engineer shall, in all cases, be final.
- D. The Contractor shall coordinate the installation of all electrical equipment proposed for use in this project with all building trades (architectural, structural, mechanical, etc.). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy the plans and specifications.
- E. If substitutions are made in lieu of equipment specified, the manufacturer's literature shall be submitted to the Engineer for approval. In the case of lighting fixtures, full IES photometric test reports for the fixture, lamp(s), and lenses shall be submitted for approval.

1.9 SUBMITTALS

- A. The Contractor shall prepare, submit, and obtain Engineer's review of manufacturers' submittals on the following equipment and systems prior to ordering, purchasing, or installation of any equipment or materials. All required submittals shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review.
 - 1. Submit a listing of all the materials indicated below, with the type of material, manufacturer and catalog or model number for each (where applicable):
 - Package #1
 - Conductors
 - Conduit
 - Multiconductor Cables
 - Wiring Devices and Plates
 - Disconnect Switches
 - Time Switches
 - Photocells
 - Lighting Contactors
 - 2. Submit complete shop drawings of the following when supplied by the electrical contractor:
 - Package #2
 - Fuses and/or Circuit Breakers
 - Short Circuit and Coordination Study
 - Transformers
 - Surge Protective Devices

Panelboards and Cabinets

Package #3

Lighting Fixtures

Occupancy Sensors

Lighting Control Panels

Dimming System

Package #4

Fire Alarm System

Package #5

Lightning Protection

3. Submit test reports as required in section 3.07 - Electrical Testing.
- B. All shop drawing approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.
- C. Review of shop drawings by the Engineer does not relieve the Contractor from responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements (roof penetrations, wall penetrations, floor penetrations, curbs, electrical, etc.) of all approved equipment with the other trades and disciplines at no additional cost.
- D. All shop drawings shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.
- E. Provide Material Safety Data Sheet (MSDS) or letter from manufacturer certifying the VOC content for each field-applied adhesive, sealant, paint and coating.
- F. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01600 Sustainable Design Requirements.

1.10 COORDINATION OF TRADES

- A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B. Work shall not be performed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated equipment installed should they interfere with the proper installation and mounting of mechanical equipment, ceilings and other architectural or structural finishes.
- C. The Contractor shall coordinate the elevations of all equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.
- D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.
- E. The Contractor shall confirm that work installed under this section does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.
- F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.

1.11 WARRANTY

- A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.
- B. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner.

The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

1.12 TEMPORARY LIGHT AND POWER

- A. The Contractor shall provide a temporary service of the amperage and voltage required by the Project Manager.
- B. Sufficient wiring, outlets and lamps shall be installed to ensure proper lighting in accordance with OSHA, state and municipal codes. Refer to Division 1 specifications for requirements.

1.13 EQUIPMENT REQUIRING ELECTRICAL SERVICE

- A. Review all specification sections and drawings including mechanical, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.
- B. Prior to installing material such as electrical equipment, devices, feeders, or branch circuits serving equipment of all other trades, the Contractor shall coordinate with the electrical requirements of the equipment to be installed.

1.14 MECHANICAL SYSTEMS COORDINATION

- A. All control wiring for mechanical systems shall be installed under Division 15.
- B. Motor controllers (starters) shall be furnished under Division 15 and installed under Division 16, unless specified otherwise.
- C. Power wiring to all motors and motor controllers and between motors and controllers shall be provided in Division 16.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Contract Documents shall be suitable for the intended use and shall be subject to approval by the Engineer.
- B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.
- C. All equipment shall bear the inspection label of Underwriters Laboratories Inc.
- D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.
- E. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.

2.2 IDENTIFICATION

- A. Equipment or devices specified in the individual sections to be identified shall be identified by machine cut stencil unless the equipment is identified by the manufacturer. Identification of flush mounted cabinets and panelboards shall be on the inside of the device. Surface mounted equipment shall be identified on the outside cover. Equipment operating on 208Y/120 volt system shall be identified with black labels with white inner core.
- B. All switchboards and panelboards supplied by a feeder shall be stencil-labeled to indicate the equipment where the power supply originates.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Mounting heights, unless otherwise noted, are to be center line of the equipment and/or device except the mounting height of suspended light fixtures which is to the bottom of fixture.
- B. All work shall be designed and installed to comply with the requirements for the seismic design category and use group for the area in which the building is constructed.

3.2 EXCAVATION, TRENCHING & BACKFILLING

- A. Contractor shall call underground utilities locator company before digging.
- B. Barricades shall be provided around open holes and trenches. Temporary bridges shall be provided over trenches cut through major sidewalk routes. Major sidewalk routes shall not be closed to pedestrian traffic.
- C. Barriers shall be provided to protect landscaping adjacent to the excavation area.
- D. When rocks, concrete or other debris are encountered during excavation, remove completely.
- E. Where sidewalk sections must be removed for installation of underground ducts, remove the sidewalk sections completely from joint to joint.
- F. Where asphalt must be removed for installation of underground ducts, saw cut the asphalt in two, straight, parallel lines.
- G. Backfill excavations in 6-inch layers and mechanically compact to 98 percent compaction.
- H. Excavated materials may be used as backfill only if the backfill is sand or clean dirt that is free of rocks and debris over 3/4" in diameter.
- I. In landscaped areas, backfill and mechanically compact to a depth of 6 inches below grade.
- J. Backfill the last 6 inches with clean topsoil. Reseed lawn areas.
- K. Restore concrete sidewalks and asphalt.
- L. The Contractor shall perform all excavation to install the work herein specified and as indicated on drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and others excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done except under pavement.
- M. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, and tamped. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.
- N. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and tamped until the crown of the pipe is covered by a minimum of 6" of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 98% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off. A

metallic lined underground warning tape shall be provided 12" below finished grade. The tape shall be red for electrical lines and orange for telephone and shall be identified as to the type of line.

- O. Perform excavation and backfilling work in accordance with applicable portions of the earthwork section.

3.3 STORAGE AND PROTECTION OF MATERIALS

- A. Refer to the general requirements section of the specifications, Division 1, for storage, protection, and handling requirements.
- B. Inspect materials upon arrival at project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material.
- C. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact.
- D. Containers which are broken, opened, watermarked, or otherwise damaged materials are unacceptable and shall be removed from premises.
- E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.4 CONCRETE WORK

- A. Construct curbs, pads, vaults and similar supports for electrical equipment where required.
- B. Provide 4" thickness housekeeping pads at floor mounted equipment, covering entire area occupied by equipment. Dowel pads to structural slab.
- C. Perform concrete work in accordance with applicable portions of Concrete sections. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

3.5 PAINTING

- A. Except as otherwise specified, painting shall be accomplished under Painting Section. Surfaces shall be left clean of debris and free from oil and other substances which would prevent paint bond.
- B. Touch up finishes of factory painted apparatus where finish is marred during installation.
- C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.
- D. Do not paint over nameplates on equipment, nonferrous hardware, accessories or trim.

3.6 WORKMANSHIP

- A. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components.

3.7 ELECTRICAL TESTING

- A. Furnish all labor, materials, instruments, supplies, and services and bear all costs for the accomplishment of the tests herein specified or requested at job site. Correct all defects appearing under test, and repeat the tests until no defects are disclosed, leave the equipment clean and ready for use.
- B. All grounds, crosses, shorts, etc., must be eliminated from the wiring. Test all lighting fixtures, together with switches and controls; test the operation of all motors, controllers, and other electrical equipment devices.
- C. The switchboard and all feeders shall be Meggar tested. A copy of all test reports shall be given to the Engineer.
- D. The Contractor shall perform any tests other than herein specified which may be required by the Engineer or the authority having jurisdiction.

- E. Perform the following tests after installation but before energizing the equipment. The following tests and procedures apply to all equipment and material that is to be tested under this Contract.
 - 1. Transformers
 - a. Visually inspect all components for damage, check bushings and insulators for cracks; transformer casing for evidence of leakage; pressure, temperature and liquid level gauges for proper indications.
 - 2. Ground Resistance
 - a. Visually inspect for specified ground connections.
 - b. Perform ground resistance test at all connections to switchboards and panelboards.
 - c. Use three point or fall of potential method.
 - d. Verify single point connection (at the counterpoise) between the grounded and grounding systems.
 - e. Additional ground rod is required if resistance is greater than 25 ohms.
 - 3. Switchboards and Panelboards
 - a. Visually inspect all components for damage.
 - b. Check operation of circuit breakers/fusible switches.
 - 4. Ground Fault Systems
 - a. Visually inspect for damage and improper connections.
 - 5. Transfer and Other Relay Schemes
 - a. Investigate intended function, and verify correct operation.
- F. The Engineer shall be notified immediately of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.
- G. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to meet the specified requirements.

3.8 TRAINING

- A. Upon completion of the work, the Contractor shall conduct operation and training session(s) for the Owner's key personnel. These sessions shall be of sufficient length and duration to adequately explain the design intent and proper operating and maintenance techniques for all equipment and systems. After these sessions are completed, the Contractor shall provide a copy of a signed statement by the Owner that his personnel are thoroughly familiar with and capable of operating all equipment and systems.

END OF SECTION

SECTION 16110

CONDUIT AND RACEWAYS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. This section covers the complete interior and exterior conduit system.
- B. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 STANDARDS

- A. Industry Standards
 - 1. Underwriters Laboratories Inc. (UL) Publications
 - No. 1: Standard for Flexible Metal Conduit
 - No. 6: Standard for Rigid Metal Conduit
 - No. 467: Standard for Grounding and Bonding Equipment
 - No. 651: Standard for Schedule 40 and 80 Rigid PVC Conduit
 - No. 797: Electrical Metallic Tubing - Steel
 - No. 1242: Standard for Electrical Intermediate Metal Conduit - Steel
 - 2. American National Standards Institute (ANSI)
 - C-80.1: Rigid Galvanized Conduit
 - C-80.3: Electrical Metallic Tubing

1.3 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install conduits and raceways, complete, as indicated on the Drawings and as specified herein.
- B. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturers
 - 1. Metallic Conduit Fittings
 - a. Thomas and Betts
 - b. Appleton
 - c. RACO
 - d. Crouse Hinds
 - e. Steel City
 - 2. Support Channel
 - a. Unistrut
 - b. Kindorf
 - 3. Non-metallic Conduit Fittings
 - a. Carlon
 - b. Georgia Pipe Company
 - 4. Rigid, IMC or Flexible Conduit
 - a. Allied
 - b. Republic
 - c. Triangle
 - d. Wheatland

- e. Youngstown
- f. Southwire
- 5. Flexible Conduit (PVC Conduit)
 - a. Anaconda "Sealtite"
 - b. Robroy
 - c. Southwire
- 6. Electrical Metallic Tubing
 - a. Steeltubes
 - b. National
 - c. Wheatland
 - d. Allied
 - e. Triangle
 - f. Youngstown
- 7. Plastic PVC
 - a. Carlon
 - b. Georgia Pipe Company
- 8. Pull Box Manufacturer(s)
 - a. Hoffman
 - b. OZ Gedney
 - c. Or Approved Equal
- 9. Approved Marker Tape Manufacturer(s)
 - a. William Frick & Associates
 - b. Or Approved Equal
- 10. Approved Maintenance Hole/Handhole Manufacturer(s)
 - a. Old Castle
 - b. Pencil (Handholes Only)
 - c. Quazite (Handholes Only)
 - d. Or Approved Equal
- 11. Approved Conduit Plug/Cap Manufacturer(s)
 - a. Jack Moon
 - b. Or Approved Equal

2.2 CONDUIT FITTINGS

- A. Electrical metallic tubing (EMT) couplings and connectors shall be steel. Malleable iron, pressure cast or die cast fittings are not permitted.
- B. Fittings and couplings shall be set-screw type and/or compression type per 3.01 13. Steel set screw type for 2.5" conduit and larger shall have 2 screws for connectors and 4 screws for couplings. All connectors shall be insulated throat type.
- C. Rigid steel and IMC couplings and connectors shall be standard threaded couplings, locknuts, bushings and elbows. All materials shall be steel. Erickson-type couplings may be used to complete a conduit run.

2.3 NON-METALLIC CONDUIT AND FITTINGS

- A. Non-metallic conduit shall be heavy wall, Schedule 40 PVC.
- B. Couplings and connectors for non-metallic conduit shall be of the same material and be the product of the same manufacturer of the conduit furnished.
- C. PVC conduit for concrete encasement shall be Type DB, UL Labeled for 90 degrees C cables. Fittings shall be Type DB, solvent type, and from the same manufacturer as the conduit.
- D. Concrete shall have a minimum strength of 2,500 psi at 28 days.

2.4 CONDUIT SUPPORT

- A. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose and sized appropriately for the conduit type and diameter. Support individual

- conduits 1-1/2" and smaller with 1/4" threaded steel rods and use 3/8" rods for 2" and larger.
- B. Conduit support channels shall be 14-gauge galvanized (or equivalent treatment) channel sized for the amount of conduit to be supported. Channel suspension shall be 3/8" threaded steel rods. Conduit straps shall be spring steel type compatible with channel.
 - C. Conduit straps shall be single-hole cast metal type or two-hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.
- 2.5 RIGID METALLIC CONDUIT, INTERMEDIATE METALLIC CONDUIT, AND ELECTRICAL METALLIC TUBING
- A. Rigid metallic conduit and intermediate metallic conduit shall be steel and standard thread.
 - B. Electrical metallic tubing (EMT) shall be steel.
- 2.6 RIGID METALLIC, INTERMEDIATE METALLIC, AND FLEXIBLE CONDUIT AND FITTINGS
- A. Rigid metallic conduit and intermediate metallic conduit shall be steel and standard thread.
 - B. Flexible conduit shall be steel or aluminum type classified for system grounding.
 - C. Connectors for flexible conduit shall be insulated throat type rated as suitable for system ground continuity.
 - D. Flexible conduit used for other than connections to lighting fixtures shall not be less than 1/2" trade size. 3/8" flexible conduit may be used for connection to lighting fixtures when sized according to the National Electrical Code.
 - E. Flexible conduit used in damp or wet locations shall be liquid tight.
- 2.7 PULL BOXES
- A. Pull boxes shall be constructed of galvanized steel with flat, removable covers fastened with plated steel screws.
 - B. Pull boxes shall be equipped with keyhole screw slots in the cover to permit removal of the cover without extracting the screws.
 - C. Pull boxes shall have provisions for grounding.
- 2.8 MAINTENANCE HOLES/HANDHOLES
- A. Maintenance Holes
 1. Maintenance holes shall be pre-cast or cast in place concrete with a strength of 3,500 psi at 28 days, and steel reinforced.
 2. Maintenance holes shall include a cast iron frame with cover, a hot dipped galvanized steel ladder, and hot dipped galvanized pulling eyes embedded in the concrete opposite each duct entrance and in the floor beneath the cover.
 3. Maintenance holes shall be equipped with grounding busbar.
 4. Maintenance holes shall be equipped with racking for cable storage.
 5. Ground splices and connections at maintenance holes shall be exothermic welds, copper or bronze compression ground fittings, or bolted compression ring lugs.
 6. The cover for electrical maintenance holes shall have the lettering, "POWER" or "ELECTRIC."
 7. The cover for low voltage maintenance holes shall have the lettering, "COMMUNICATIONS."
 - B. Handholes
 1. Handholes shall be non-conductive and shall not require grounding for safety. Handholes shall be unaffected by freeze/thaw and resistant to sunlight and chemicals. Handholes shall be pre-cast polymer concrete, heavy duty rated and bottomless.
 2. Handholes shall be equipped with racking for cable storage.

3. Electrical handholes shall have the word "POWER" or "ELECTRIC" molded in the cover by the manufacturer. The cover shall be attached with penta-head stainless steel bolts.
4. Low voltage handholes shall have the word "COMMUNICATIONS" molded in the cover by the manufacturer. The cover shall be attached with penta-head stainless steel bolts.
5. Handholes shall be able to withstand 10,000 lbs minimum.
6. See Drawings for handhole dimensions and locations.

2.9 CONDUIT PLUGS/CAPS

- A. Conduit Plugs/Caps
 1. Conduit plugs shall provide a watertight seal at expose ends of conduits.
 2. Conduit plugs shall be conduit size specific.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General
 1. Minimum size for electrical conduits shall be 1/2" trade size.
 2. Minimum size for low voltage conduits shall be 3/4" trade size.
 3. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the drawings.
 4. Leave all empty conduits with a 200 pound test nylon cord pull line.
 5. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.
 6. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel.
 7. Protect conduits against dirt, plaster, and foreign debris with conduit caps or plugs, which shall remain in place until all masonry is complete. Protect conduit stub-ups during construction from damage, any damage conduits shall not be used and are to be replaced.
 8. All feeder conduits shall be cleared of any dirt, foreign debris, etc.
 9. Install conduit with wiring, including homeruns as indicated on the drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a Contract change. Deviations shall be made only where necessary to avoid interferences and when approved by Engineer by written authorization.
 10. Conduits which penetrate roof membranes shall be installed in accordance with manufacturer's recommendations and architectural specifications.
 11. Seal all conduits entering building from below grade, all conduits entering refrigerated spaces i.e. freezers and coolers, and all conduits entering exterior mounted electrical equipment with insulating electrical putty to prevent entrance of moisture.
 12. Separate raceway systems are to be installed for power systems and for control, signal and communications systems. Do not install control, signal or communications cables in the same raceways as branch circuit or feeders cables, unless indicated otherwise on the drawings.
 13. Conduit fittings shall be set screw type for dry, indoor environments. Conduit fittings shall be gland and ring compression type for all conduit exposed to outdoor environments or wet locations.
 14. Conduit shall be run parallel or at right angles to walls, ceilings, and structural members.
 15. Support conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, fitting, panelboard, enclosure or cabinet. Support conduits

from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.

16. Attach feeder conduits larger than one inch trade diameter to or from structure on intervals not exceeding twelve feet with conduit beam clamps, one-hole conduit straps or trapeze type support.
17. Where conduits must pass through structural members obtain approval of Architect.
18. Install all conduits or sleeves penetrating or routed within rated fire walls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.
19. Provide expansion and deflection coupling where conduit passes over a building expansion joint.
20. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
21. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
22. Telephone and signal system raceways: 2" trade size and smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
23. Conduit shall be installed for feeders on the supply side of any panelboard(s) supplying branch circuits for pools, spas or hot tubs.
24. In inmate accessible areas
 - a. Do not install exposed conduit system unless specifically indicated on the drawings.
 - b. Where exposed conduit is indicated on the drawings, all conduits shall be rigid metallic type and all outlet boxes shall be cast metal type with threaded hubs.
 - c. Install conduits flat against wall; offsets or "kicks" shall be permitted only to enter outlet box.
 - d. Support conduits on centers not exceeding 5'-0" and within 12" of each outlet box using two-hole conduit straps attached to surface with non-removable break off security type bolts.
 - e. Compression couplings and fittings shall be used for work within walls which are grout-filled.

B. Uses Permitted

1. Conduits installed within concrete floor slabs shall be galvanized rigid steel (GRS), intermediate metal conduit (IMC), Schedule 40, heavy wall PVC, or electrical non-metallic tubing (ENT).
2. Conduit run exterior exposed: Galvanized rigid steel (GRS) or intermediate metal conduit (IMC).
3. Conduits in direct contact with earth shall be Schedule 40, heavy wall PVC. Elbows for underground conduits greater than 200' in length shall be galvanized rigid steel (GRS), or electrical metallic tubing (EMT) if elbows are concrete encased. Service entrance conduits installed exposed, or concealed in walls or above ceilings, shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC). Unless indicated otherwise, service entrance conduits shall be

installed "outside" of the building as defined by the NEC. Provide concrete encasement where required or as indicated on drawings.

4. All other conduit, unless specified herein, not permitted in accordance with the NEC, or otherwise indicated on the drawings, shall be electrical metallic tubing (EMT). PVC conduit is not allowed in exposed or concealed areas, but only within concrete or below grade. Feeder or branch circuit conduits that emerge from a floor slab in an exposed location shall be galvanized rigid steel (GRS), electrical metallic tubing (EMT) or intermediate metal conduit (IMC). Where conduits emerge from a floor slab in a concealed location (a wall cavity or above ceiling), PVC elbows are permitted, provided that a conduit adaptor for steel conduit is installed at the nearest point at the slab.
5. Use flexible conduit for connections to motors, electrical heaters, unit heaters, kitchen equipment, laundry equipment, flush mounted lighting fixtures, and any vibrating equipment.
 - a. Flexible conduit used for connection of motors, dry type transformers, electric duct heaters, unit heaters, and bus duct tap devices shall not exceed 36 inches in length.
 - b. Flexible conduit from outlet box to flush mounted lighting fixture shall not exceed 6 feet in length.
 - c. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
 - d. Flexible conduit installed within plenum spaces shall be limited to lengths not exceeding 4 feet.
 - e. Liquid tight flexible conduit shall be used to connect equipment in exterior, damp or wet locations.
6. All conduit from the fire pump controller to the fire pump shall be either galvanized rigid steel (GRS) or liquid tight flexible conduit.

C. Below Grade Raceway Installations

1. Install top of conduits 2 inches minimum below bottom of building slabs.

D. Raceway Installations within Concrete

1. Conduit shall be run following the most direct route between points.
2. Conduit shall not be installed in concrete where the outside diameter is larger than 1/3 of the slab thickness.
3. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduit shall not be run directly below and parallel with load bearing walls.
4. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
5. Provide expansion fittings in all conduits that pass through building expansion joints.

3.2 PULL BOXES

- A. Pull boxes shall be secured, independent of the conduit entries into the box. Pull boxes shall be secured to the building structure. In ceiling applications, pull boxes shall not be supported with ceiling wires.
- B. Conduits entering pull boxes shall connect to pull boxes using die-cast zinc connectors.
- C. Pull boxes shall be free from burrs, dirt and debris.

3.3 MAINTENANCE HOLES/HANDHOLES

- A. Maintenance holes/handholes shall be installed on a base of pea gravel at least 12 inches deep.
- B. Tops of maintenance holes/handholes shall be level with the existing grade.
- C. Ducts should enter as perpendicular to the wall surface as possible.
- D. Maintenance holes shall be grounded with four 3/4 inch diameter by 8 foot long ground rods, one driven inside of the maintenance hole at each corner. Connect the ground rods

and any duct bank ground conductors together with a No. 4/0 AWG bare, stranded copper ground wire loop. A No. 2 AWG bare stranded copper pigtail from the ground wire loop shall be used to ground the maintenance hole cover frame, ladder support bracket, any metallic concrete inserts and metallic cable racks, and the shields of any cables that are spliced in the maintenance hole.

3.4 CONDUIT PLUGS/CAPS

- A. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until ready for use.
- B. Simplex, triplex or quadplex duct plugs shall be installed in conduits to house and seal cables.

3.5 ADDITIONAL REQUIREMENTS FOR INTERIOR LOW VOLTAGE CONDUITS

- A. Conduit runs shall not have more than two (2) 90-degree bends between pull points.
- B. Communications conduit system shall contain no condulets (also known as an LB).
- C. Rigid metal conduit (RMC) or intermediate metal conduit (IMC) shall be used for entrance conduits that exceed 50 feet into the building.
- D. Horizontal Conduits
 - 1. Support horizontal conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, backboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
 - 2. For runs that total more than 100 feet in length, insert pull boxes so that no segment between boxes exceeds the 100 feet limit.
 - 3. Each horizontal home-run conduit can serve from one (1) to three (3) outlet boxes. For one (1) outlet box, a 3/4" conduit shall be used, minimum. For two (2) outlet boxes, a 1" conduit shall be used, minimum. For three (3) outlet boxes, a 1-1/4" conduit shall be used, minimum.

3.6 REQUIREMENTS FOR OUTSIDE PLANT LOW VOLTAGE CONDUITS

- A. Duct Banks
 - 1. Duct banks shall be sloped downward toward maintenance holes/handholes and away from buildings a minimum of 6 inches per 100 feet. Duct banks shall not route water from maintenance holes/handholes into buildings. Duct banks shall not contain traps between maintenance holes/handholes where water may accumulate.
 - 2. Where power and communications duct banks run in parallel, they shall be separated by a minimum of 12 inches.
 - 3. Where duct banks enter maintenance holes or buildings, they shall be constructed as integral to the wall.
 - 4. Duct bank shall extend to the inside surfaces of the walls, and the duct bank reinforcing shall be integrated with the wall reinforcing.
 - 5. Bell ends shall be provided on ducts where the ducts enter maintenance holes or buildings.
 - 6. Direct buried ducts and fittings shall have bend radii greater than the minimum bend radii of the cables enclosed, and shall not be smaller than the radii of standard manufactured elbows.
 - 7. Direct buried ducts shall be installed parallel to or at right angles to building lines and site features, and as close to curbs and sidewalks as possible to avoid interferences with future landscaping.

8. Where direct buried PVC ducts cannot be buried deep enough to meet the NEC minimum cover requirements, rigid steel conduits shall be installed instead, or a concrete cover shall be poured over the ducts.
 9. An orange detectable marker tape (for communications) shall be buried in the backfill approximately 12 inches above duct banks or direct buried cables for the entire length of the duct run.
 10. A flexible mandrel and a stiff bristled brush shall be pulled through the ducts to clean them prior to cable pulling.
 11. Ducts shall be identified in the maintenance holes and at both ends.
- B. Additional OSP Conduit Requirements
1. Install a #14 AWG tracer wire in one conduit for the entire length of each duct run.
 2. Below Grade Conduit Installations
 - a. Install top of conduits 24 inches minimum below finished grade or as indicated on Drawings.
 - b. Install top of conduits 6 inches minimum below bottom of building slabs.
 3. For runs that total more than 400 feet in length, insert handholes/maintenance holes so that no segment exceeds the 400 feet limit.

END OF SECTION

SECTION 16115

FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Applicable requirements of Division 16 shall be considered a part of this section and shall have the same force as if printed herein full.
- B. This document describes the products and execution requirements relating to Firestopping for Electrical Systems.
- C. Product specifications, general design considerations, and installation guidelines are provided in this document. Typical firestopping installation details will be provided on Drawings as an attachment to this document. If the bid documents are in conflict, the Drawings shall take precedence. The successful Contractor shall meet or exceed all requirements described in this document.

1.2 WORK INCLUDED

- A. The work included under this Specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.
- B. The work shall include, but not be limited to the following:
 - 1. Furnish and install all Firestopping Materials.

PART 2 PRODUCTS

2.1 APPROVED PRODUCTS

- A. Approved Firestopping manufacturer(s)
 - 1. FlameStopper Thru-Wall Fitting - Wiremold Company (Firestop Devices)
 - 2. Tremco Inc. (Firestop Cast in Place Sleeves, Caulks, QuickComm Sleeves, QuickComm Units, Pillows, Putty Pads, Outlet Box Inserts, Silicone, Composite Sheets, Collars, Devices)
 - 3. STI Firestop Products (Firestop Devices, Putties, Caulks, Sealants, etc.)
 - 4. Hilti (Putties, Caulks, Sealants, etc.)

2.2 TYPES OF PRODUCTS

- A. Firestop Products
 - 1. Intumescent Firestop Sealants and Caulks
 - 2. Acrylic Firestop Sealant and Caulks
 - 3. Silicone Firestop Sealants and Caulks
 - 4. Cast in Place Devices
 - 5. Firestop Putty, Putty Pads
 - 6. Outlet Box Inserts
 - 7. QuickComm Sleeves
 - 8. TREMstop Straps
 - 9. Firestop Collars
 - 10. Wrap Strips
 - 11. Firestop Mortar
 - 12. Firestop Pillows
 - 13. Accessories: Forming/Damming Materials: Mineral Wool, Backer Rod or other type as per manufacturer recommendation.
- B. Firestop Devices

1. Thru-Wall Fitting (FlameStopper by Wiremold)
 - a. The firestop device box shall be constructed of 16-gauge G90 steel.
 - b. The firestop device intumescent block shall be constructed of a graphite base material with expansion starting at 375 degrees F and an unrestrained expansion between 6 to 12 times. The intumescent block shall be held securely by the box in order to prevent tampering and damage during installation.
 - c. The firestop device shall have doors which can be adjusted to prevent materials from penetrating the device if the device is empty or completely full. The doors shall be constructed of 16-gauge G90 steel with No. 10-32 screws use to adjust opening size.
 - d. The firestop device shall be available for 2" and 4" trade size EMT conduit.
 - e. The firestop device shall be available in safety yellow powder coat, custom colors and an unpainted galvanized finish.
2. Fire Rated Cable Pathway (STI EZ-PATH)
 - a. Fire rated cable pathway device modules shall be comprised of steel raceway with intumescent foam pads allowing 0 - 100% cable fill.
3. Tremco (QuickComm Unit) 24" x 12" or 34" x 18"
 - a. Fire rated steel frame with an intumescent channel. UL Tested for large openings with 100% visual cable fill. UL Tested for Concrete Floors, Block Walls, Dry Walls and Hollow Core Floors.
4. Tremco (QuickComm Sleeve)
 - a. Fire rated steel sleeve with an intumescent inner sleeve. UL Tested for Concrete Floors, Block Walls, Dry Walls, Hollow Core and Fluted Decks.

2.3 UL CLASSIFICATION

- A. Thru-Wall Fitting: The firestop device for use in through-penetration firestop systems shall have been examined and tested by Underwriters Laboratories Inc. to UL1479 (ASTM E 814 & ASTM E 84).
- B. Threaded, Smooth and Split-Sleeve Firestop Devices: Firestopping sealants and devices shall be used together as a firestop system. All firestop systems shall bear a UL Classification system number.
- C. QuickComm Sleeve: Firestop Sleeve for use in through penetration firestop systems. Shall be tested by Underwriters Laboratories Inc. or a recognized Testing Laboratory for through penetration fire stopping applications.
- D. QuickComm Unit: Intumescent Firestopping Unit for use in large openings for firestopping for cables, Fiber optic, Power Control, Telecommunications
 1. Threaded Firestop System
 - a. Block Wall - W-J-3049
 - b. Dry Wall - W-L-3138
 2. Threaded Firestop System (Vertical)
 - a. Slab - F-A-3010
 3. Smooth Firestop System
 - a. Block Wall - W-J-3048
 - b. Dry Wall - W-L-3137
 4. Split-Sleeve Firestop System
 - a. Block Wall - W-J-3047
 - b. Dry Wall - W-L-3136
 5. Tremco QuickComm Sleeve
 - a. Block Wall- C-AJ-0123, C-AJ-2580, C-AJ-3270
 - b. Dry Wall- WL-0025, WL-2418, WL-3318
 - c. Concrete Floor- C-AJ-0123, C-AJ-2580, C-AJ-3270
 - d. Fluted Deck- C-AJ-0123
 - e. Hollow Core- C-AJ-0123, C-AJ-2580, C-AJ-3318

- 6. Tremco QuickComm Unit
 - a. Dry Wall- WL-3319, WL-4070
 - b. Concrete Floor- F-A-3035, F-A-4006

2.4 FIRESTOPPING SYSTEMS

- A. Thru-Wall Fitting Firestop System
 - 1. The device shall be classified for use in one-, two-, three-, and four-hour rated gypsum, concrete and block walls and provide an L rating of less than 5 cfm. The device shall also be tested by Underwriters Laboratories Inc. to UL2043 and determined to be suitable for use in air handling spaces.
- B. Threaded, Smooth and Split-Sleeve Firestop Systems
 - 1. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 and ASTM E 84 (UL 1479) fire tests in a configuration that is representative of field conditions.
 - 2. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
- C. Firestopping materials and systems must be capable of closing or filling through-openings created by the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials.
- D. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
- E. Firestopping sealants must be flexible, allowing for normal pipe movement.
- F. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
- G. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
- H. Firestopping material shall be installed inside the cavity of the wall as shown by the annular space requirements in the UL Tested System.

PART 3 EXECUTION

3.1 CONDITIONS REQUIRING FIRESTOPPING

- A. General
 - 1. Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.
- B. Through-Penetrations
 - 1. Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.
- C. Membrane-Penetrations
 - 1. Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet ASTM E 814 and ASTM E 84 Test requirements.
- D. Smoke-Stopping
 - 1. As required by the other sections, smoke-stops shall be provided for through-penetrations, membrane-penetrations, and construction gaps with a material approved for the ASTM E 136 Standards.

3.2 EXAMINATION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Verify that environmental conditions are safe and suitable for installation of firestop products.
- C. Verify that all pipes, conduit, cable, and other items that penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.3 INSTALLATION

A. General

- 1. Through Penetration firestop submittals showing each UL Rated Assembly shall be located in the general Contractor's trailer for Inspection purposes.
- 2. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Written documentation stating training done on the specific project shall be supplied to the General Contractor for inspection purposes. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
- 3. Apply firestops in accordance with UL Tested Systems, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
- 4. Unless specified and approved, all insulation used in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
- 5. Seal holes and penetrations to ensure an effective smoke seal. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
 - a. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
 - b. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.

B. Dam Construction

- 1. When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.

3.4 FIELD QUALITY CONTROL

- A. Preconstruction meeting shall take place to address firestopping systems to be installed.
- B. Prepare and install firestopping systems in accordance with UL Tested System and manufacturer's printed instructions and recommendations.
- C. Follow safety procedures recommended in the Material Safety Data Sheets.
- D. Finish surfaces of firestopping that are to remain exposed in the completed work to a uniform and level condition.
- E. All areas of work must be accessible until inspection by the applicable Code Authorities.
- F. Correct unacceptable firestops and provide additional inspection to verify compliance with this Specification.

3.5 CLEANING

- A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.
- B. Leave finished work in a neat and clean condition with no evidence of spillovers or damage to adjacent surfaces.

END OF SECTION

SECTION 16120

CONDUCTORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install conductors, complete, as indicated on the Drawings and as specified herein. Provide a complete system of wiring with all feeders and branch circuits as shown on the Drawings. The wiring system shall be complete to each and every outlet and apparatus shown on the Drawings which requires electrical connections.
- B. This section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 600 volts or less.

1.3 COLOR CODING

- A. Color coding shall be as follows:

120/208 Volt System	277/480 Volt System
Phase A –Black	Phase A - Brown
Phase B – Red	Phase B - Orange
Phase C – Blue	Phase C - Yellow
Neutral – White	Neutral - Gray
Ground – Green	Ground - Green
Isolated Ground - Green with yellow strip (where applicable)	

(Verify color-coding with local code Authority and use local code requirements if and only if the above color code is not acceptable to local authority.)

- B. All wire shall be color coded throughout its entire length. Colored phase tape is not allowed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Wire shall be Southwire/SIMPULLTM, Pirelli, Rome, General Cable, Senator, United Copper Industries, Alcan, AFC, or approved equal.

2.2 CONDUCTORS

- A. Conductor Material: Unless noted otherwise, conductors shall be copper, 98.5% conductivity except where specifically noted otherwise on Drawings.

- B. All wire and cable for feeders and branch circuits shall have copper conductors and shall be 600 volts, 90 degrees C, NEC type conductors with THHN/THWN-2 insulation.
- C. Wire No. 8 AWG and larger shall have stranded conductors. Wire No. 10 AWG and smaller shall be solid conductor type.
- D. No conductor shall be smaller than No. 12 AWG unless otherwise specified or noted. [For wiring within dwelling units, No. 14 AWG is allowed for 15-amp circuits, unless prohibited by the authority having jurisdiction.]
- E. Branch circuit wiring which supplies more than one fluorescent fixture through the wiring of other fixtures shall be high temperature wire approved for such use.
- F. Pulling lubricant is neither required nor allowed for Southwire/SIMPull™ conductors.
- G. Nonmetallic-sheathed cable shall be permitted in one-, two- and multi-family dwellings permitted to be of Types III, IV, and V Construction, where permitted by local authority.

2.3 ALUMINUM CONDUCTORS

- A. Where substituted for copper conductors, aluminum conductors shall match or exceed copper ampacity.
- B. Aluminum conductors shall be compact, Alcan, or Southwire. Conductors shall be AA-8000 series.
- C. Aluminum conductors shall not be used for branch circuits, and shall not be installed to any vibrating equipment (e.g. mechanical equipment, transformers, elevators, fire pumps). Minimum rating of feeder size shall be 100 amps.
- D. Mechanical screw-type connectors shall comply with the following:
 1. Connectors shall be dual rated (AL7CU or AL9CU) and listed by UL for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.
 2. Using a suitable stripping tool, to avoid damage to the conductors, remove insulation from the required length of the conductor.
 3. Wire brush the conductor and apply a listed joint compound.
 4. Tighten the connection per the connector manufacturer's recommendation.
 5. Wipe off any excess joint compound.
- E. For connection to aluminum bus, the following hardware shall be used:
 1. Bolts: Anodized alloy 2024-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.
 2. Nuts: Aluminum alloy 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.
 3. Washers: Flat aluminum alloy 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2.
 4. Lubricate and tighten the hardware as per the manufacturer's recommendations.
- F. For connection to copper bus, the following hardware shall be used:
 1. Bolts: Plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.
 2. Nuts: Heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B.
 3. Washers: Should be steel, Type A plain standard wide series conforming to ANSI B27.2.
 4. Belleville conical spring washers: shall be of hardened steel, cadmium plated or silicone bronze.
 5. Lubricate and tighten the hardware as per the manufacturer's recommendations.
- G. Aluminum conductors shall not be used where expressly forbidden by the local electrical inspections department or plan review board of jurisdiction. The electrical contractor shall verify this requirement prior to bid.
- H. Aluminum conductors shall not be connected to equipment which is not UL Listed for aluminum.
- I. Service entrance cable, Type SE (XHHW), Style SER, 600 volt, aluminum alloy shall be permitted as unit panel feeder in multifamily dwellings.

2.4 METAL CLAD "MC" CABLE

- A. Where allowed by the authority having jurisdiction, the use of metal clad cable is permitted as described below and shall meet all the requirements of the following codes and standards:
 - 1. Underwriters Laboratories Inc. 83, 1479, 1569, and 1581
 - 2. National Fire Protection Association NFPA 70, Article 330
 - 3. All local codes and municipal ordinances.
- B. The conductors of the metal clad cable shall comply with Articles 1.03 and 2.02 of this same section.
- C. Unless noted otherwise on drawings, MC cable shall be limited to branch circuits concealed in walls, above ceilings and within electrical rooms. For MC cable circuits powered from a surface-mounted panelboard, cable homeruns shall be installed to a metal wireway above the panelboard, and conductors (without armor) shall be routed within metal conduit(s) from wireway to panelboard. Ampacity adjustment factors are not necessary for conduit lengths of 24" or less.
- D. MC cable shall not be allowed for wiring to mechanical equipment, except for within the dwelling units.
- E. Unless noted otherwise, the metal clad cable shall be **MC** with either a galvanized steel jacket or aluminum interlocked armor, a Mylar assembly covering tape, rated at 90 degrees centigrade, with either a green insulated grounding conductor or MC^{AP} Type MC cable with interlocked armor that is listed and identified for grounding, and rated for a maximum of 600 volts.
- F. Where indicated, the metal clad cable shall be a **Jacketed Metal Clad and Parking Deck Cable** with a black or gray PVC covering, using solid copper conductors, a Mylar assembly covering tape, rated at 90 degrees centigrade, with a green insulated grounding conductor and rated for a maximum of 600 volts.
- G. Where indicated, the metal clad cable shall be **MC/IG Isolated** Ground Cable using a galvanized steel jacket (blue with green strip), solid copper conductors, a Mylar assembly covering tape, rated at 90 degrees centigrade, with a green insulated grounding conductor, an extra green with yellow strip insulated grounding conductor and rated for a maximum of 600 volts. Type HCF MC^{AP} cable shall be permitted.
- H. MC cable installed to wiring devices or fixed electrical equipment in patient care areas shall have both an insulated grounding conductor and a cable armor listed as a ground path per NEC 517. Type HCF MC^{AP} cable shall be permitted.
- I. Refer to National Electrical Code Article 330 for uses not permitted.
- J. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1/16 inches thick, shall be considered supported and secured where such support does not exceed six (6) feet intervals.
- K. Cables containing four or fewer conductors sized not larger than No. 10 AWG shall be secured within 12 inches of every box, cabinet, fitting or other cable termination.
- L. Metal clad cable shall not be installed outside the building without written authorization from the Engineer.

2.5 ACCESSORIES

- A. Wire Joints: T & B "Sta-Kon," Scotchlok Type "R," Ideal No. 452 or 453, or Buchanan "B-Cap."
- B. Cable Connectors: Solderless Type O.Z. "circular clamp type" or T & B "lock-tite" appropriate for the particular application involved.

PART 3 EXECUTION

3.1 PREPARATION

- A. Lubricant: No grease, oil or lubricant other than powdered soapstone or approved pulling compound shall be used to facilitate the pulling of wires. Lubricant shall not be used for conductors with SIMpull™ insulation.

3.2 INSTALLATION

- A. Complete electrical systems shall be provided as shown on the Drawings and/or as specified herein.
- B. Wires shall be pulled without excessive strain to prevent damage to conductor or insulation. Provide pull boxes as required to facilitate pulling of wire.
- C. Prior to energizing, all service and feeder cables shall be tested with megohm meter to determine insulation resistance levels. Test report shall be submitted to the Engineer.
- D. Each raceway indicated by symbol on Drawings shall contain three (3) No. 12 AWG wires unless otherwise noted, scheduled or indicated. Hatch marks on raceway symbols indicate the number of conductors in a raceway when the number exceeds three (3).
- E. At each fixture or device outlet, a loop or end of wire not less than 6" long shall be left for connection to fixture or device.
- F. Splices, taps and connections shall be made up as follows:
 - 1. Wire sizes No. 10 AWG and smaller with wire nuts.
 - 2. Wire and cable of sizes No. 8 AWG and larger, with insulated mechanical or crimped connectors.
- G. Perform conductor tests as described in Section 16000 - Electrical General.

END OF SECTION

SECTION 16130

OUTLET BOXES AND JUNCTION BOXES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install outlet and junction boxes, complete, as indicated on the Drawings and as specified herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made the Contractor shall be responsible for the costs of any item and engineered and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

1.4 JOB CONDITIONS

- A. Protection: Anchor boxes securely to formwork. Provide necessary protection to prevent entry of concrete.
- B. Sequencing, Scheduling: Locations of outlets shown on the Drawings are relative and approximate. Exact locations shall be determined on the job and the outlets accurately set according to the architectural drawings, dimensions, casework kneespace, building conditions, furniture positions and Architect's direction. The right is reserved to change the exact location (10'-0" or less) of any switch, ceiling outlet or other outlet in any room before it is permanently installed without increase in Contract cost.
- C. All outlet boxes and junction boxes shall be accessible. Any boxes in non-accessible areas (furred ceilings) shall be set flush with barrier surface at a location approved by the Architect.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturers: National Electric Products Company, Thomas & Betts/Steel City, Appleton or Raco.
- B. Acceptable Manufacturers: Thomas & Betts/Steel City, Pass & Seymour or equal.

2.2 OUTLET BOXES

- A. Standard Outlet Boxes: Boxes and covers shall be galvanized steel not less than 1/16" thick and in every instance, of such form and dimensions as to be adapted to its specific use and location, kind of fixtures to be used and number, size and arrangement of conduits connecting thereto and particularly sized to accommodate the number and size of wires to be contained therein.
- B. Standard Outlet Boxes: Boxes and covers shall be thermo plastic or phenolic and rated according to the space it occupies, of such form and dimensions as to be adapted to its specific use and location, kind of fixtures to be used and number, size and arrangement of conduits connecting thereto and particularly sized to accommodate the number and size of wires to be contained therein.
- C. Ceiling outlet boxes shall be 1-1/2" or 3-3/8" deep, 4" octagonal (or 4" square when required due to number of wires). Plaster rings or device covers need not be provided on ceiling boxes. Provide extension rings on ceiling boxes to accommodate number of conductors in box.
- D. Wall outlet boxes for toggle switches and convenience outlets shall be 1-1/2" or 2-1/8" deep, 4" or 4-11/16" square. Provide with single-device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.
- E. Outlet boxes for telecommunication purposes (telephone, data, etc.) shall be 4" x 4" square, 2-1/8" deep. Provide with single device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.
- F. Junction boxes shall be as specified for ceiling and wall outlet boxes. Provide flat covers on ceiling outlets to match ceiling finish. Provide blank device type coverplates on wall outlets, of same materials as specified for device coverplates in same room or area.
- G. Outlet boxes where exposed rigid conduit is used shall be cast ferrous alloy, galvanized or cast aluminum.
- H. Covers: Where outlet boxes are to be capped, blank coverplates shall be used.
- I. Barriers: Provide barriers between devices operating at different voltages or on separate systems such as normal, critical, or life safety.

2.3 FLOOR BOXES

- A. Product Description
 - 1. Floor boxes for receptacles and telephone/data outlets shall be rectangular for conference A/V applications and fitness equipment, and round for standard general purpose use, non-metallic PVC. Boxes shall be suitable for use in slab-on-grade or above grade. Boxes shall include a non-metallic concrete cover to prohibit concrete or debris from entering the box during installation.
 - 2. Provide number of compartments as indicated on drawings.
 - 3. Coverplates and flanges shall be brass.
 - 4. Floor box device covers shall meet UL 514C requirements for scrubwater test standards.
- B. Manufacturer
 - 1. Hubbell PFBRG Series
 - 2. Walker/Wiremold 880MP Series
 - 3. Thomas & Betts 640P Series

- C. Manufacturer
 - 1. Hubbell RF400 Series
 - 2. Thomas & Betts 68P Series
- D. For poke-thru devices, refer to 2.04 D of Section 16140 - Wiring Devices.

2.4 PULL AND JUNCTION BOXES

- A. Pull and Junction boxes are not completely indicated. They shall be sized and installed where required in accordance with the NEC.
- B. Pull and Junction boxes shall be the suitable NEMA type number to match the environmental conditions.
- C. Locations of concealed pull and junction boxes shall be indicated on the record as built drawings for Owner's record.

2.5 CABINETS, FITTINGS, BOXES: GENERAL

- A. Cabinets shall be in accordance with UL 50, "Electrical Cabinets and Boxes" and NEMA 250, Type 1. Electrical cabinets, boxes and fittings shall be as required for types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and accessories required for the intended use. Provide gaskets for units in damp or wet locations.
- B. Construction shall be sheet steel, NEMA 1 class except as otherwise indicated. Cabinets shall consist of a box and a front consisting of a 1-piece frame and a hinged door. Arrange door to close against a rabbet placed all around the inside edge of the frame, with a uniformly close fit between door and frame. Provide concealed fasteners, not over 24" apart, to hold fronts to cabinet boxes and provide for adjustment. Provide flush or concealed door hinges not over 24" apart and not over 6" from top and bottom of door. For flush cabinets, make the front approximately 3/4" larger than the box all around. For surface mounted cabinets make from same height and width as box. Furnish metal barriers to separate wiring of different systems and voltage, and furnish accessory feet where required for freestanding equipment.
- C. Fasteners for general use shall be corrosion resistant screws and hardware including cadmium and zinc plated items.
- D. Fasteners for damp and wet locations shall be stainless steel screws and hardware.
- E. Exterior finish shall be gray baked enamel for items exposed in finished locations except as otherwise indicated.
- F. Painted interior finish, where indicated, shall be white baked enamel.
- G. Fittings for boxes, cabinets, and enclosures shall be in accordance with UL 5148 and shall be zinc plated steel for conduit hubs, bushings and box connectors.

2.6 UNDERGROUND PULL/JUNCTION BOXES

- A. Unless noted otherwise, underground enclosures shall be fiberglass, open-bottom and sloped-wall. Covers shall be polymer concrete. Boxes shall be installed in areas expected to experience only light incidental, non-deliberate vehicular traffic (including that from mowers).
- B. Enclosures shall meet the load requirements and three-point test procedures specified in the industry standard ANSI SCTE 77 2007. Enclosures shall meet the Tier 8 cover load test (for light traffic) of 12,000 lbs. over a 10" x 10" plate.
- C. Manufacturer's guidelines shall be followed for installation, including 6" gravel bed beneath box for stability and drainage. Concrete collar shall be poured around enclosure to protect the ring and top from impact due to soil erosion.
- D. Manufacturer
 - 1. Highline Products
 - 2. OZ-Gedney

PART 3 EXECUTION

3.1 INSPECTION

- A. The location of all wall outlets, including light fixtures, receptacles, switches, etc., shall be checked to see that the outlet will clear any wall fixture, shelving, work tables, sinks, baseboard and fin type convectors, bulletin boards, etc., that will be installed.
- B. Exact locations of outlet boxes shall be coordinated with other trades so that outlet will not be covered by ductwork, piping, etc.
- C. The approximate locations of outlets are indicated on the Drawings. The exact locations shall be determined at the building. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

3.2 PREPARATION

- A. Architectural Placement: Outlets occurring in architectural features shall be accurately centered in same. Space wall switch outlets equidistant from door trims on the strike side of doors as actually installed so that coverplate clears trim. Orientation of outlet boxes (horizontal or vertical) shall be as indicated on architectural elevations.
- B. Install all outlet boxes in finished areas flush with wall or ceiling finish. Maintain 1/4" or less space between outlet box front and finish wall surface.
- C. All switches at same level shall be installed on one horizontal line as shown on the Drawings.
- D. Wall mounted controls, including temperature controls, in a room shall be grouped at the same location and at same mounting heights.

3.3 INSTALLATION

- A. At all concealed outlets for electric lights, switches, wall receptacles, etc., standard outlet boxes and plaster rings shall be provided.
- B. Outlet boxes shall be firmly anchored in place and shall be provided with approved fixture studs where required. Outlet boxes shall not depend on the coverplate to hold it secure to the wall.
- C. Boxes on opposite sides of walls or partitions: Where drawings show back-to-back wiring devices, the devices on opposite sides of the wall shall be offset a minimum of 6". Through-the-wall type boxes shall not be used. Where boxes will be located on opposite sides of walls or partitions located 24" or closer to each other, moldable putty pads shall be installed to completely cover the exterior surfaces of the box within the stud cavity with a ball of putty material used to plug the end of each conduit at its connection to the box.
- D. All holes cut through new or existing smoke or fire partitions shall be sealed. Sealant shall be 3M Brand Fire Barrier System or approved equal. Seals shall be installed in accordance with manufacturer's recommendations.
- E. All flush boxes in rated walls that are larger than 16 square inches in area shall be backed as follows: 1-hour wall - 1 layer of 5/8" gypsum board; 2-hour rated wall - 2 layers of 5/8" gypsum board. Gypsum shall be fire code and attached to outside surfaces of box(es).
- F. Cast aluminum, threaded hub type boxes with gasketed weatherproof covers shall be used for wet locations where box is surface mounted.
- G. Location of floor boxes indicated is approximate. The Contractor shall refer to the final furniture layout or request field instructions for the exact location. Consult the Architect prior to installation.
- H. For outlet and junction boxes installed within grout-filled walls, boxes shall be sealed externally with duct tape to prevent entry of concrete into boxes.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install wiring devices, complete, as indicated on the Drawings and as specified herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. The following manufacturers are allowed:
 - 1. Hubbell
 - 2. Pass & Seymour
 - 3. Cooper
 - 4. Leviton
 - 5. Thomas & Betts/Steel City
 - 6. Walker/WiremoldWhen substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.
- C. This section includes receptacles, connectors, switches, dimmers, timeclocks and coverplates.

1.3 QUALITY ASSURANCE

- A. Wiring devices shall comply with applicable sections of NEMA Standard WD-1, NFPA 70, Article 100.
- B. All special purpose receptacles shall be NEMA standard configuration.
- C. Comparative devices by acceptable manufacturers are equal.

PART 2 PRODUCTS

2.1 WIRING DEVICE DESCRIPTION AND MANUFACTURER - COMMON AREAS

- A. Single & Duplex Receptacles (20 Amp)
 - 1. Single or duplex type receptacle as indicated. 125V/20/A/2P/3W/G rating - NEMA - 5-20R type.
 - 2. Face color shall be as directed by architect or to match surrounding surface.
 - 3. Manufacturer
 - a. Hubbell 5362
- B. GFCI Duplex Receptacles
 - 1. Duplex, feed-thru type ground fault current interrupter receptacle with test/reset buttons. 125V/20A/2P/3W/G rating - NEMA 5-20R type conforming to UL #498, UL #943 Class A and NEMA #WD1-4.02.
 - 2. Manufacturer
 - a. Hubbell GF20 Series
- C. Isolated Ground Single & Duplex Receptacles

1. Single or duplex type receptacles as indicated. 125V/20A/2P/3W/IG rating - NEMA 5-20R type ground internally isolated from receptacle frame and ground pigtail or terminal screw.
2. Manufacturer
 - a. Hubbell IG5352
- D. Clock/Flat Screen Receptacles
 1. Single type receptacle with a recessed outlet clock hanger type mounting coverplate. 125V/15A/2P/3W/G - NEMA 5-15R type.
 2. Manufacturer
 - a. Hubbell RR151CH Series
- E. Maintained Contact Switches
 1. Provide toggle operated switches SPST, DPST, 3-way or 4-way operation as indicated. 277V/20A rating, quiet type, maintained contact, and a green hexagonal ground screw or ground pigtail, and side wired.
 2. Manufacturer
 - a. Hubbell 1221 Series (Color to match receptacles).
- F. Momentary Contact Switches
 1. Provide toggle or key operated switches as indicated with single circuit, 3-position center-off operation. 277V/20A rating, quiet type, momentary contact, spring loaded switch, and green hexagonal ground screw or ground pigtail, back and side wired.
 2. Manufacturer
 - a. Hubbell HBL 155* (Color to match receptacle).
- G. Maintained Contact Slider Type Switch (For Multi-Ganging with Dimmers)
 1. Slide-operated switch (to match dimmer), single pole, 3-way or 4-way operation as indicated, 120/277V, 20A rating.
 2. Manufacturer
 - a. Leviton Monet Series
 - b. Lutron Nova T Series
- H. Slider Type Incandescent Dimmers
 1. Slide operated AC incandescent solid state type dimmer with positive ON/OFF switching, integral surge protection, voltage stabilized output, RFI filtered and maximum lighting level adjustment. 120V/60Hz, unless noted otherwise, with lettering and/or nameplate as indicated. Dimmers shall have lowest profile available (wattage permitting).
 2. Manufacturer
 - a. Leviton Monet Series
 - b. Lutron Nova T Series
- I. Illuminated Toggle Switches
 1. Single pole, 3-way or 4-way, as indicated, conforming to UL #20, NEMA #WDI-3.02 and F.S. #W-S-896E. 277V/20A rating, quiet type, maintained contact, and a green hexagonal ground screw or ground pigtail, back and side wired. Red colored toggle to glow when switch is on.
 2. Manufacturer
 - a. Hubbell HBL 1221PL
- J. Weather-Resistant Receptacles
 1. All 15- and 20-amp receptacles installed in damp or wet locations shall be listed weather-resistant type.

2.2 COVERPLATE DESCRIPTION AND MANUFACTURER - COVERPLATES

- A. Flush Mounted Interior Receptacle/Switch Coverplates
 1. Single or multi-gang to match device type. Medium size (4-7/8" min.), standard depth, smooth finish with nylon material.

2. Color to match device color.
3. Coverplates in mechanical/electrical equipment rooms and high abuse areas shall be stainless steel, non-magnetic.
4. Manufacturer
 - a. Hubbell NPJ Series (nylon)
 - b. Hubbell SS Series (stainless steel)
- B. Weatherproof Device Coverplates
 1. Provide weatherproof "in use" cast aluminum lockable covers. Plastic covers are allowed on dwelling balconies.
 - a. Hubbell WP Series
 - b. Thomas & Betts Russell Stoll Series
- C. Security Coverplates
 1. Security coverplates shall be one-piece #14 cold-rolled zinc-plated steel with ground tab. Plates shall have polyester powder-coated white finish. Backplates shall be #10 galvanized steel, and shall use 4 #8-32 x 1/2" stainless steel T-20 torxhead screws with center-pin reject. Plate shall be UL Listed.
 - a. Single-pole Switch Hubbell SWP1
 - b. Duplex receptacle Hubbell SWP8
- D. Multi-Outlet Raceway
 1. Product Description
 - a. Two-piece rectangular surface raceway of length as prescribed. Stainless steel type 304 housing complete with all bends, fittings, couplings, caps and mounting hardware.
 - b. Single 15A/125V grounding outlets UL Labeled and full length ground wire.
 - c. Outlets 18" on centers starting no less than 9" from end.
 - d. Maximum of six outlets per circuit. Where two or more circuits are utilized the outlets shall be on alternate circuits.
 2. Manufacturers
 - a. Walker/Wiremold
 - b. Hubbell

2.3 MISCELLANEOUS ITEMS

- A. Time Switches
 1. Electronic Astronomical Schedule Type
 - a. 365 day scheduling, solid state, skip-a-day feature, daylight saving changeover, leap year adjusted with capacitor backup, DPDT-120V/20A rated contacts, light sensor input.
 - b. Acceptable Manufacturer
 - 1) Tork DZS Series (channels as required)
- B. Photoelectric Control Switches
 1. Product Description
 - a. Raintight photoelectric self-contained control for switching.
 - b. Die-cast housing with adjustable sensor.
 2. Manufacturers
 - a. AMF/Paragon
 - b. Tork 2100 Series
- C. Lighting Contactor
 1. Product Description
 - a. Multi-pole contactor for switching branch circuit tungsten and ballast lighting and resistant heating loads.
 - b. Number of poles as indicated (paralleling multiple contactors is acceptable), poles rated for 20 amperes @ 600V continuous duty.

- c. Mechanically held contactor with coil clearing contacts, operating coil voltage to match circuit characteristics.
 - d. Housed in panelboard (if indicated).
 - D. Poke-thru Floor Devices
 - 1. Product Description
 - a. Refer to drawings for specific features.
 - b. Device shall meet UL 514A requirements for scrubwater test standards.
 - 2. Manufacturer
 - a. Hubbell
 - b. Walker/Wiremold
 - c. Thomas & Betts/Steel City
 - E. Single/Multiple Station Smoke Alarms: Each sleeping room shall be provided with a smoke alarm. Alarms shall be 120V (with battery back-up) with built-in evacuation horn, power-on indicator and auxiliary contact. Where more than one is installed in a dwelling unit, activation of one detector shall trigger all alarms in that unit. Alarms shall have integral alarm silencing feature.
 - F. Single/Multiple Station Combination Smoke/Carbon Monoxide Alarms: Each area outside of a sleeping room shall be provided with a combination smoke/carbon monoxide alarm. Alarms shall be 120V (with battery back-up) with built-in evacuation horn, power-on indicator and auxiliary contact. Where more than one is installed in a dwelling unit, activation of one detector shall trigger all alarms in that unit. Alarms shall have integral alarm silencing feature.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All dimmer circuits shall have dedicated neutrals.
- B. Install decorative plates on switch, receptacle, and blank outlets when indicated.
- C. Install devices and wall plates flush and level.
- D. Coordinate the exact location of wiring devices with other trades and architectural features. Do not locate devices on two different architectural finishes such as half on wall tile and half on painted surface, unless noted otherwise.
- E. Provide plaster rings in areas requiring them due to construction.
- F. Where more than one device is indicated, arrange in gangs covered with one coverplate per manufacturer's instructions.
- G. Where dimmer(s) and switch(es) are shown adjacent to one another, switch(es) shall be a maintained contact switch matching dimmer style, so that a common, multi-gang faceplate can be used.
- H. Provide 6" long ground wire from grounding lug to all switches and receptacles to a screw type bonding device on the conduit or outlet box.

END OF SECTION

SECTION 16150

MANUAL AND MAGNETIC STARTERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install manual and magnetic starters, complete, as indicated on the Drawings and as specified herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.
- C. The work required under this section of the Specifications consists of the installation of manual or magnetic starters for use on systems 600 Volts and below for all integral or fractional horsepower motors not controlled by starters in a motor control center or by starters provided as an integral component of a specific piece of equipment.

1.3 QUALITY ASSURANCE

- A. The following Specifications and standards are incorporated into and become a part of this Specification by reference. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements and errata) on the date of invitation for bids, shall apply. In text, such Specifications and standards are referenced by basic designation only.
 - 1. National Electrical Manufacturers Association (NEMA) Standards
 - a. ICS-1: General Standards for Industrial Control and Systems
 - b. ICS-2: Industrial Control Devices, Controllers and Assemblies
 - c. ICS-3: Industrial Systems
 - d. ICS-4: Terminal Blocks for Industrial Control Equipment and Systems
 - e. ICS-6: Enclosures for Industrial Controls and Systems
 - 2. Underwriters Laboratories Inc. (UL) Publications
 - a. UL 198.2: High Interrupting Capacity Fuses, Current Limiting Type
 - b. UL 198.4: Class R Fuses
 - c. UL508: Industrial Control Equipment
 - 3. National Fire Protection Association (NFPA)
 - a. NFPA 70: National Electrical Code
 - 4. American National Standards Institute (A.N.S.I.)
 - a. C97.1: Low Voltage Cartridge Fuses, 600 Volts or Less
- B. Coordination
 - 1. Review shop drawings submitted under this and other sections, as well as other divisions, to ensure coordination between work required among different trades. Coordinate the installation sequence with other contractors to avoid conflicts and to provide the fastest overall installation schedule. Coordinate installation with architectural and structural features, equipment installed under other sections of

the Specifications and electrical equipment to ensure access and so that clearance minimums are provided.

1.4 SUBMITTALS

- A. Product Data: For each type of starter, accessory, and component indicated. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Products of the following manufacturers, which comply with these Specifications, are acceptable.
 - 1. Motor starters and controllers
 - a. Westinghouse/Cutler Hammer
 - b. Square D
 - c. General Electric
 - d. Allen-Bradley
 - e. Siemens (I.T.E.)
 - 2. Fuses
 - a. Chase-Shawmut
 - b. Bussman

2.2 GENERAL

- A. Furnish all materials specified herein. Provide a starter for each motor furnished on the project, except where controllers are specified to be furnished as integral with the motor/equipment.
- B. Motor starter units, circuit breakers, and fused devices shall be UL Listed and bear the UL Label.
- C. Enclosure shall be NEMA Type one gasketed in all interior dry locations and shall be NEMA Type 3R in all damp, wet, or exterior locations, unless other type is indicated on the drawings or specified herein.
- D. The motor starters shall be rated for the system voltage in which they are installed.
- E. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type, unless otherwise indicated on the drawings or specified herein.
- F. All combination starters shall have provisions for padlocking unit handle in the open de-energized position.
- G. Furnish an equipment grounding conductor lug, bonded to the starter enclosure.
- H. Load current and overload relay heater list shall be compiled by the Contractor after motors have been installed. Arrange to demonstrate selection of heaters to suit actual motor nameplate full load currents.
- I. Starters are to be mounted in motor control centers where indicated on drawings.

2.3 MANUAL AND MAGNETIC STARTER MATERIAL DESCRIPTION

- A. Magnetic starters shall be minimum NEMA Size 0, the combination type, molded case circuit breaker or motor circuit protectors unless otherwise indicated on the drawings or specified herein. UL Listed interrupting rating of molded case circuit breaker or motor circuit protectors shall not be less than 10,000 AIC or as indicated on the drawings at system voltage. Fusible switches shall have rating, fuses and number of poles as indicated on the drawings. Fusible switches shall contain rejection type fuse clips that will accept only Class "RK1" current limiting fuses.
- B. Each magnetic starter shall have three overload relays. Control voltage shall be 120 volts provided from a control power transformer built into starter. Provide fuse for control coil in the primary circuit for each phase connection.

- C. Manual motor starters shall be manually operated, trip free, quick make quick break switching device with motor running protection overload heaters elements in each underground conductor of the motor circuit. Provide red neon "running" pilot lamp in cover of starter. Manual starters installed in finished spaces shall be recessed mounted in wall with flush cover.
- D. Magnetic starter doors shall be interlocked to prevent door from being opened until switch is in the "OFF" position. However, a "cheater screw" or other inconspicuous means shall be provided to permit access to energized starter, by authorized personnel. An interlock contact shall be provided within the starter to open control circuit to magnetic starter when device handle is in the open position. A door activated interlock switch is not acceptable.
- E. Each magnetic starter shall be provided with H.O.A. switch, on-off switch, start-stop push button or provisions for remote mounted control device as indicated on the drawings. Where no device is indicated on the drawings, provide an H.O.A. switch for any motors automatically controlled or an ON-OFF switch for those specified to be manually controlled. Provide each magnetic starter with a "RUN" and an "OVERLOAD" pilot lamp. Control devices shall be of oil-tite construction. Identify each control and pilot device with a metal tag or plastic laminated label.
- F. Overload heaters shall be non-adjustable and manually reset melting alloy or bi-metallic type shall be selected in accordance with full load rating of motors actually furnished. A heater schedule applicable to starter size shall be provided on inside of door of each magnetic starter. Relay switching mechanism in magnetic starters shall be single pole, double throw normally open position connected to operate a door mounted, oil-tite blue pilot lamp to indicate starter has tripped on overload.
- G. Provide contacts in magnetic starters to provide interlocking control sequence of operation specified under Division 15 or 16. Provide one N.O. and one N.C. spare auxiliary contact in each starter.
- H. Starter sizes are based on design conditions using horsepower ratings of motors indicated on drawings. If motors actually furnished have horsepower ratings other than those indicated, motor starters and feeders shall be adjusted in accordance with the rated horsepower at no additional cost to the Owner.
- I. Nameplates
 - 1. Each magnetic and manual motor starter shall be provided with an engraved plastic nameplate approximately 1" x 3" permanently attached to the unit exterior door of magnetic starters or to the wall above or below manual motor starters.
 - 2. Refer to the electrical general section of these Specifications for nameplate requirements.
- J. Two-speed magnetic starters shall be for two-winding two-speed motors. Starters shall be combination type with dual sets of overload relays, hand-off-automatic switch and fast-slow-stop selector switch and "hi-low" pilot lamps.
- K. Reduced voltage magnetic starters shall be closed transition, Auto transformer provided with 50%, 65%, and 85% taps, wye, non-combination type. Combination type shall be provided with non-fused switch, molded case circuit breakers motor circuit protectors fusible switch unless otherwise indicated on the drawings or specified herein. U. L. listed interrupting rating of molded case circuit breaker or motor circuit protectors shall not be less than 10,000 AIC or as indicated on the drawings at system voltage. Fusible switches shall have rating, fuses and number of poles as indicated on the drawings. Fusible switches shall contain rejection type fuse clips that will accept only Class "RK1" current limiting fuses.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Locate motor starters to provide working clearance and be fully accessible as required by the National Electrical Code.
- B. Lace and group conductors installed in starter with nylon tie straps. Only one conductor shall be installed under terminals. Form and train conductors in enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond 1/8" from terminal lug.
- C. Mounting and Support
 - 1. Mounting
 - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. A 1.5" minimum diameter round washer shall be used between head of screw or bolt and enclosure.
 - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified. Mount with operating handle at 60" AFF, unless other height is indicated.
 - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
 - d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device.
 - e. Where enclosure is not indicated on a wall or structure, construct a metal channel (strut) free standing frame secured to floor, pad, or other appropriate building structure.
 - f. Mount starter with control devices between 48" and 60" above floor or grade, unless otherwise indicated on the drawings.
- D. Do not splice conductors in enclosure. Where required install junction box or wireway adjacent to disconnect and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specification and do not exceed.
- E. Conductors not terminating in starter shall not extend through or enter starter enclosure.
- F. Install push-in knock-out closure plugs in any unused knock-out openings.
- G. Current limiting type RK1 dual element time delay fuses shall be furnished and installed in each combination fused device; rating shall be as shown on the drawing.

3.2 CLEANING AND ADJUSTMENT

- A. After completion, clean the interior and exterior of dirt, paint, and construction debris.
- B. Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.
- C. Select and install overload heaters based on the full load current of the motor actually installed. All overload heaters which experience a nuisance trip shall be replaced with the next larger overload heater size.
- D. Adjust motor circuit protector settings in accordance with the manufacturer's recommendations to sustain motor locked rotor current.

END OF SECTION

SECTION 16160

PANELBOARDS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.
- B. Provide the panelboards indicated on the Drawings complete with overcurrent protection devices and spaces.
- C. This section includes panelboards and distribution panelboards and associated auxiliary equipment rated 600 V or less as shown on the drawings.
- D. Refer to panel schedule and one-line power diagram on drawings for specific requirements of each panel.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install panelboards, complete, as indicated on the Drawings and as specified herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.3 QUALITY ASSURANCE

- A. Panels shall be factory assembled.
- B. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to ensure panel access and so that clearance minimums are provided.
- C. Components and installation shall be in accordance with NFPA 70, "National Electrical Code," NEMA PBI, "Panelboards" and UL67 and UL50.
- D. Panelboards and load centers shall be listed and identified for use with 75 degrees C rated conductors.

1.4 SUBMITTALS

- A. Refer to Section 16000 - Electrical General for submittal requirements.
- B. Manufacturers Product Data:
 - 1. Submit material Specifications and installation data for products specified under Part 2 - Products to include:
 - a. Overcurrent protection devices
 - b. Panelboards
- C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the Contract Drawings.
 - 1. Include electrical characteristics and ratings for each panelboard with dimensions, mounting, bus material, voltage, ampere rating, mains, poles and wire connection, and any accessories. Indicate method of ground bus attachment to enclosure.
 - 2. Include bussing diagram indicating each bussing overcurrent protection device position.

3. Provide a schedule indicating overcurrent protection device type, trip and size, poles, frame type, interrupting capacity.

1.5 SHORT CIRCUIT AND COORDINATION STUDY

- A. Overcurrent protective devices shall be selectively coordinated for distribution systems serving emergency and standby loads, as well as those serving multiple elevators, for faults with durations at 0.01 seconds.
- B. Manufacturer of switchboards and panelboards shall provide a short circuit and coordination study for:
 1. Distribution systems required to be selectively coordinated that contain circuit breakers.
 2. Distribution systems containing breakers with adjustable trip settings.
 3. Distribution systems requiring arc-flash analysis.
- C. Where required for selective coordination purposes, the coordination study shall be included in the shop drawing submittals for the equipment.

1.6 ARC FLASH SAFETY

- A. The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D, and IEEE 1584 – Guide for Performing Arc Flash Hazard Calculations.
- B. Arc Flash Hazard Analysis
 1. Manufacturer of panelboards shall provide an arc flash hazard analysis for the electrical distribution system. Include this study in the shop drawing submittals for the equipment.
 2. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
 3. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
 4. The flash protection boundary and the incident energy shall be calculated and reported at all significant locations in the electrical distribution system (panelboards) where work could be performed on energized parts.
 5. The arc flash hazard analysis shall include all MV, 575v, and 480v locations and locations in 240 volt and 208 volt systems rated 400 amps and above.
 6. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
 7. The arc flash hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
 8. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
 9. Arc flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.
 10. The report shall indicate incident energy and flash protection boundary calculations as follows:
 - a. Arcing fault magnitude
 - b. Device clearing time

- c. Duration of arc
 - d. Arc flash boundary
 - e. Working distance
 - f. Incident energy
 - g. Hazard risk category
 - h. Recommendations for arc flash energy reduction
- C. Arc Flash Warning Labels
- 1. Contractor shall field-install arc flash labels on equipment that includes the available incident energy and required personnel protective equipment (PPE).
 - 2. The vendor shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
 - 3. The label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following information:
 - a. Location designation
 - b. Nominal voltage
 - c. Flash protection boundary
 - d. Hazard risk category
 - e. Incident energy
 - f. Working distance
 - g. Engineering report number, revision number and issue date
 - 4. Labels shall be machine-printed, with no field markings.
 - 5. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings:
 - a. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided.
 - 6. Labels shall be field-installed by the engineering service division of the equipment manufacturer.
- D. Arc Flash Training
- 1. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Panelboard manufacturer shall be:
 - 1. Siemens
 - 2. Square D
 - 3. General Electric
 - 4. Cutler-Hammer
- B. Coordination panelboard manufacturer (fusible panelboards) shall be:
 - 1. Cooper Bussman
 - 2. Mersen

2.2 GENERAL REQUIREMENTS

- A. All panels and overcurrent protection devices shall be UL Listed and bear a UL Label. Where panel serves as service entrance equipment, panel shall bear a UL Label indicating suitability as service entrance equipment.
- B. Panels shall be of the dead front safety type.

- C. Provide panels complete with factory assembled circuit breakers or fuses connected to the bus bars in the positions shown on the panel schedules.
- D. Provide all panelboards fully rated to the A.I.C. ratings noted on the schedules, but not less than 10,000 amperes for 120/208 volt panelboards and not less than 14,000 amperes for 277/480 volt panelboards. All devices in a panelboard shall be rated for the A.I.C. ratings shown for the panelboard.

2.3 BUSSING AND INTERIORS

- A. All bus bars shall be copper. Main lugs and main overcurrent protection devices shall be UL approved for copper or aluminum conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain a full size grounding bus. All panelboards shall contain a full size insulated neutral bus unless otherwise indicated on the drawings.
- B. The neutral and ground bus shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection.
- C. Where designated on panel schedule as "space," include all necessary bussing, device support and connections. Provide blank cover for each space.
- D. Where specified or indicated on the drawings, provide sub-feed lugs adjacent to the mains or feed-through lugs opposite end of mains and increase box heights to provide additional cable bending and termination space. Lugs to be the same size and capacity as mains and rated for aluminum or copper conductor terminations.

2.4 ENCLOSURES

- A. Panelboard width shall not be less than twenty inches unless indicated on the drawings (32" minimum for distribution panelboards).
- B. Provide concealed captive clamping devices, concealed hinges and chrome lock for all flush mounted panels. Key all panels throughout project alike.
- C. Where two section panels are required, both sections shall have fully rated bus, separate cabinets connected by conduit nipples. Interconnect sections with copper conductors with ampacity equal to rating of main bus. Route phase and neutral conductors together between panels. Provide separate trims for each section.
- D. Panelboard trims for surface mounted panelboards shall be continuously hinged on one side so that when opened, wiring gutters are completely exposed.
- E. Provide a label for each branch circuit, feeder, and main circuit breaker in distribution panels, permanently attached per the requirements of Section 16000 - Electrical General, 2.02A.
- F. Cabinets, flush or surface mounted as indicated. NEMA PB-1, Type 1 enclosure, except where the following enclosure requirements are indicated:
 - 1. NEMA 250, Type 3R - Raintight.
 - 2. NEMA 250, Type 3S - Raintight and dust tight.
 - 3. NEMA 250, Type 4X - Corrosion-resistant stainless steel enclosure, watertight, dust tight, and resistant to oil and coolant seepage. This type shall be used in kitchen areas.
 - 4. NEMA 250, Type 12 - Dust tight, dripproof, and resistant to oil and coolant seepage.
- G. Enclosure shall be fabricated with galvanized steel. Trims shall have electrostatic applied ANSI gray enamel finish and adjustable indicating trim clamps for securing trim to the enclosure. Screwed-on trims shall not be acceptable. Trim shall have an angle support along the bottom serving as a support between trim and enclosure for safe installation and removal of trim.
- H. Exterior Panels: Panelboards mounted outside of building shall be in NEMA type 3R enclosures. Panelboards shall have in addition to the standard specified items the following:
 - 1. Piano hinge

2. Seams continuously welded
3. Rolled lip around door and cabinet
4. No knockouts or holes
5. Neoprene gaskets on inside of door
6. Stainless steel hardware
7. Drip hood at top above door

2.5 CIRCUIT BREAKERS

- A. Interrupting rating of all circuit breakers in panelboards shall have UL rating of not less than the RMS symmetrical amps indicated on the Drawings at system voltage. Series rated devices are acceptable with the following exceptions: devices used in distribution serving emergency, standby and multiple elevator loads (selective coordination).
- B. Circuit breakers shall be provided with trip rating and poles as indicated on the drawings or specified herein.
- C. Multi-pole breakers shall be common trip and common reset; tie handle connection between single pole breakers is not acceptable.
- D. Branch circuit breakers in lighting and appliance panels shall be quick-make, quick-break, thermal magnetic type bolted to the bus. Circuit breakers in distribution type panel boards shall be bolted to the bus.
- E. Provide the following special devices and accessories when indicated on the drawings or specified herein.
 1. Ground fault interrupting circuit breakers (GFI) where indicated on the drawings.
 2. Provide handle lock-on device (to prevent manually turning off device without removal) for all overcurrent devices where indicated on panelboard schedules, and for those protecting circuits serving fire alarm equipment, and for those dedicated for powering emergency battery-powered unit equipment.
 3. Provide UL Listed "SWD" switching duty circuit breakers on the devices indicated on the drawings.
 4. Provide shunt trip device for electrically tripping circuit breakers indicated on the drawings.
 5. Overcurrent protective devices for fire alarm circuits shall have handles that are factory-marked in the color red.

2.6 FUSIBLE COORDINATION PANELBOARDS

- A. Interrupting rating of all fuses in panelboards shall have UL rating of not less than the RMS symmetrical amps indicated on the Drawings at system voltage.
- B. Fusible panelboards shall be listed to UL 67.
- C. Furnish 10% or minimum of three fuses of each rating and type of fuse installed, in addition to any spares indicated in schedule.
- D. Panelboard overcurrent device interrupting ratings shall be fully rated for the maximum available fault current and have a U.L. listed interrupting rating of 300kA and CSA certified interrupting rating of 200kA.
- E. Panelboard circuits 100A and less shall incorporate overcurrent protection and branch-circuit disconnecting means into a single integrated component.
- F. Interiors shall be factory assembled.
- G. Panelboard shall be equipped with a six-space spare fuse compartment for storing replacement branch circuit fuses.
- H. Bus bars shall be tin-plated copper.
- I. Neutrals shall be fully rated.
- J. Where equipped with main disconnect, permanently installed lockout means shall be provided on the disconnect for lockout tag procedures.
- K. Main disconnect shall be quick-make, quick-break type.
- L. Main and Branch Overcurrent Protection

1. All overcurrent protective devices shall have a minimum U.L. listed interrupting rating of 300kA and CSA Certified interrupting rating of 200kA.
 2. Main overcurrent protective devices shall be 600Vac UL Listed minimum 300kA IR and CSA Certified minimum 200kA IR Class J time-delay fuses or Class J performance fuses.
 3. Branch circuit overcurrent protection shall be 600Vac UL Listed minimum 300kA IR and CSA Certified minimum 200kA IR finger-safe fuse with Class J performance fuses.
 4. Where panelboard main fuses are installed, fuses in panelboard branch circuits shall selectively coordinate with main fuses for all overcurrents up to 200kA.
- M. Branch fused disconnects
1. Device shall have visible ON/OFF indication with colored and international symbol markings.
 2. Device shall provide open fuse indication permanently installed neon indicating light.
 3. Device shall be UL and cUL Listed 600Vac/200kA or 125Vdc/100kA voltage/short-circuit current rating, load-break disconnect with amp ratings and number of poles as indicated on the panelboard schedule.
 4. Fuse and disconnect assembly shall be a finger-safe component with trim installed.
 5. Fuse and disconnect shall be interlocked to disallow fuse removal while fuse terminals are energized.
 6. No special tools shall be required for fuse removal.
 7. Devices shall have bolt-on style bus connectors.
 8. Device housing shall be clearly marked with device amperage.
 9. Device shall provide fuse amp rating rejection at the following ampacities to ensure continued circuit protection at the specified circuit rating: 15A, 20A, 30A, 40A, 50A, 60A, 70A, 90A and 100A.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide from each flush mounted panelboard four (4) 3/4" empty conduits stubbed out above ceiling line and capped.
- B. Install panelboards in accordance with NEMA PB1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less" and manufacturer's written installation instructions.
- C. Mount panelboards with top circuit breaker not more than 6'-6" above finished floor.
- D. Only one conductor installed under terminal of individual circuit breakers. Form and train conductors in panel enclosure neatly parallel and at right angles to sides of box. Un-insulated conductor shall not extend beyond one-eighth inch from terminal lug.
- E. Do not splice conductors in panels. Where required, install junction box adjacent to panel and splice or tap conductors in box.
- F. Mounting and Support
 1. Mounting
 - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. Panelboards 600 amp and larger shall be secured by a minimum of eight (8) devices. A 1.5 inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.
 - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.
 - c. Attach enclosure directly to masonry, concrete, or wood surfaces.

- d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installation on steel structure or sheet rock walls.
- G. Maintain conductor phase color code requirements described in the conductors and cables section of the specifications.
- H. A typewritten branch circuit directory (based on as-built conditions) shall be provided for each panelboard and load center, permanently mounted on inside of door in a transparent, protective cover. Room number(s) or room name(s) shall be included in the circuit description in coordination with the final naming/numbering scheme for the project (e.g. "Office Receptacles" shall read "Office Receptacles – Rm. 202, 203").
- I. Any circuit breaker provided with arc energy reducing maintenance switch shall be labeled "BREAKER IS PROVIDED WITH ARC ENERGY REDUCING MAINTENANCE SWITCH". Labeling shall be per the requirements of Section 16000 – Electrical General 2.02A.
- J. Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, "Application Guide for Ground Fault Circuit Interrupters."
- K. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- L. Mounting of all panelboards and all hardware used for mounting shall be in accordance with the seismic criteria per the applicable building code.
- M. Fusible coordination panelboards shall be shipped without branch circuit fuses installed. Branch circuit fuses shall be shipped separately with the chassis. Where main fuses are specified 100A or greater, equipment shall be shipped with main fuses installed.

END OF SECTION

SECTION 16170

DISCONNECT SWITCHES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install disconnect switches, up to 1200 amps, complete, as indicated on the Drawings and as specified herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.
- C. This section includes fuses.
- D. This section includes individually mounted enclosed switches used for the following:
 - 1. Service disconnecting means.
 - 2. Feeder and branch-circuit protection.
 - 3. Motor and equipment disconnecting means.

1.3 SUBMITTALS

- A. Product Data: For each type of switch and fuse accessory, and component indicated, include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA AB 1, NEMA KS 1 and UL 98.
- C. Comply with NFPA 70.
- D. Comply with NEMA FU 1.
- E. Source Limitations: Provide fuses from a single manufacturer.

1.5 COORDINATION

- A. Coordinate layout and installation of switches and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer of fusible and non-fusible switches shall be Cutler-Hammer, General Electric, Siemens or Square D Company.
- B. Manufacturer of fuses shall be Bussman, Gould Shawmutt or Littelfuse.

2.2 ENCLOSED SWITCHES

- A. All disconnect switches shall be heavy duty type with lockable handles (general duty allowed for equipment serving dwelling units).
- B. Enclosed, non-fusible switch: NEMA KS 1.
- C. Enclosed, fusible switch, 800 A and smaller: NEMA KS 1 with clips to accommodate specified fuses and interlocked with cover in closed position.
- D. Furnish and install all safety type disconnecting switches indicated on the drawings, specified or required by the National and/or State Electrical Code. Switches shall be externally operable. If the size is not shown on the drawings, the subcontractor shall size the disconnect switch in accordance with name plate data of the equipment they serve.
- E. Coordinate with other trades that may provide unit mounted disconnect switches prior to submission of bids.
- F. Safety type disconnecting switches shall be heavy duty, 600 volt industrial type with quick-make, quick-break mechanism and interlocking cover which normally cannot be opened when the switch is in the "ON" position. Switches shall be single throw. Fusible switches shall be equipped with fuse clips to receive Bussman fuses. Switches shall have provision for padlocking in the open and closed positions. The operating handle shall be visible in either the on or off position.
- G. All fused disconnect switches mounted above 6'-6" shall be hook stick operable.
- H. Non-fused "pull-out" disconnects shall be allowed only for HVAC equipment serving dwelling units.

2.3 INTERIOR

- A. Switch blades shall be operated by rotating shaft directly connected to the operating handle mechanism. Switch blades shall be clearly visible in the open position. All switches shall have clear shields over the incoming line lugs. Line shields shall be attached in such a way that switch blade covers or arc shields need not be removed for line installation. Line and load lugs shall be front removable and suitable for copper or aluminum, 60/75 degree wire through 200A sizes, 75 degrees C wire for 400-800A sizes.
- B. Current limiting type RK1 dual element time delay fuses shall be furnished and installed as necessary; rating shall be shown on drawing.

2.4 ENCLOSURES

- A. All switches shall have NEMA type 1 general purpose enclosures unless indicated otherwise on the drawings. NEMA 3R covers shall be side hinged rather than top hinged. NEMA 1 and 3R switches through 200A sizes shall tangential knockouts for conduit line up against walls. NEMA 12 enclosures through 200A sizes shall be UL Listed for conversion to NEMA 3R usage by opening a factory provided drain hole. All types of enclosures shall have metal nameplates affixed to the cover to show the switch type and rating and clearly indicate "ON" and "OFF" direction of handle movement. Provide hubs on all NEMA 4, 4X, or 3R type disconnects.
- B. Provide manufacturer's standard factory applied finish unless otherwise indicated.
- C. Provide phenolic engraved nameplate for disconnect switches.

2.5 CONTROL POLE

- A. Where required a direct action interlock or control pole shall be affixed to the switch base in such a manner as to operate positively and only with the opening and closing of the switch power poles.

2.6 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Examine elements and surfaces to receive enclosed switches for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate disconnect switches to provide working clearance and full accessibility as required by the National Electrical Code.
- B. Mounting and Support
 - 1. Mounting
 - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. A 1.5-inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.
 - b. Enclosure shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified. Mount with operating handle at 60" AFF, unless other height is indicated.
 - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
 - d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device.
 - e. Where enclosure is not indicated on a wall or structure, construct a metal channel (strut) free standing frame secured to floor, pad, or other appropriate building structure.
- C. Do not splice conductors in enclosure. Where required install junction box or wireway adjacent to enclosure and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specifications and do not exceed.

3.3 CONNECTIONS

- A. Install equipment grounding connections for switches with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning.
- B. Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.

END OF SECTION

SECTION 16180

ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 16000 - Electrical General.

1.2 WORK INCLUDED

- A. The work required under this section of the Specifications consists of installation of enclosed circuit breakers up to 800 amps for use on systems 600 volts and below as indicated on the drawings. This Section includes individually mounted enclosed circuit breakers used for the following:
 - 1. Service disconnecting means.
 - 2. Feeder and branch-circuit protection.
 - 3. Motor and equipment disconnecting means.
- B. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install enclosed circuit breakers, complete, as indicated on the Drawings and as specified herein.
- C. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.3 SUBMITTALS

- A. Product Data: For each type of circuit breaker accessory and component indicated, include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA AB 1, NEMA KS 1, UL 98, NEMA Standards Publication AB1-1975 and Federal Specifications W-C-375B classifications.
- C. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate layout and installation of circuit breakers and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer of enclosed circuit breakers shall be Cutler-Hammer, General Electric, Siemens or Square D Company.

2.2 CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.

2.3 ENCLOSURES

- A. NEMA 1 enclosures shall be fabricated from sheet steel with ANSI 49 gray baked enamel finish. Knockouts shall be provided in enclosures for circuit breakers through 225A frame sizes. Enclosures shall be provided with a means to padlock the circuit breaker in the OFF position.
- B. NEMA 3R enclosures shall be fabricated from galvanically treated steel with ANSI 49 gray baked enamel finish. Enclosures for circuit breaker through 225A frame sizes shall have provisions for interchangeable conduit hubs. Enclosures shall be provided with a means to padlock the plate-type cover closed.
- C. Provide manufacturer's factory applied finish unless otherwise indicated.
- D. Provide phenolic engraved nameplate for circuit breakers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed circuit breakers for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate enclosed circuit breakers to provide working clearance and full accessibility as required by the National Electrical Code.
- B. Mounting and Support
 - 1. Mounting
 - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. A 1.5" minimum diameter round washer shall be used between head of screw or bolt and enclosure.
 - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified. Mount with operating handle at 60" AFF, unless other height is indicated.
 - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
 - d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device.
 - e. Where enclosure is not indicated on a wall or structure, construct a metal channel (strut) free standing frame secured to floor, pad, or other appropriate building structure.
- C. Do not splice conductors in enclosure. Where required install junction box or wireway adjacent to enclosure and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specifications and do not exceed.

3.3 CONNECTIONS

- A. Install equipment grounding connections for circuit breakers with ground continuity to main electrical ground bus.

- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.
- B. Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.

END OF SECTION

SECTION 16190

KITCHEN EQUIPMENT/BAR EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools coordination and services necessary for, and incidental to, the installation and final connection of all kitchen and bar equipment as shown and scheduled on the Drawing and/or as specified herein. Verify, coordinate and incorporate all of the applicable system requirements as a part of the work of this section.
- B. Provide complete power, pilot, control and electrical interlocks as required, through a network of panelboards, feeders, branch circuits, conduits, conductors, outlet boxes, pull boxes, junction boxes, cabinets, enclosures, devices, switches and convenience outlets with matching coverplates, hangers, supports, sleeves, escutcheons, pull tapes, other required materials, related accessories and required appurtenances to form an electrical network to serve all kitchen and bar equipment items.
- C. Mount kitchen hood exhaust/make-up air fan starters and furnish and install paper, pilot, control and interlock wiring as required.
- D. Furnish and install all power, pilot, control and interlock wiring, as required, for the kitchen hood fire suppression system.
- E. Furnish and install, complete, branch circuit protective devices in the serving panelboard with shunt-trip devices and associated power, pilot, control and interlock wiring, as required, for fire alarm shut-down, in conjunction with the hood fire suppression system, wet sprinkler fire system, etc. Should the serving panelboard not contain the required space for shunt-trip installation, furnish and install a separate panelboard for this requirement. Relays, contactors, etc., that will satisfy the fire alarm shut-down requirement, may be used in lieu of the shunt-trip devices.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Panelboards, branch circuits protective devices, and disconnect switches, shall be as specified in Section 16400 of the Specifications.
- B. Conduit, conductors, outlet boxes, pull boxes, junction boxes, cabinets, enclosures, switches, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons and other required materials shall be as specified in Section 16001 of these Specifications.
- C. Verify, coordinate and incorporate kitchen equipment suppliers equipment and material requirements into the work of this section prior to installation.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install, complete, raceway systems of interconnecting conduit, conductors, outlet boxes, pull boxes, junction boxes, switches, convenience outlets, coverplates, enclosures, cabinets, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials, related accessories and appurtenance, to form a network ready for installation and final connection of all kitchen and bar equipment items and components.
- B. The conduit system shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.

3.2 INSTALLATION OF KITCHEN HOOD SYSTEMS

- A. Install kitchen hood exhaust fan motor starters and make-up air unit motor starters, where shown on the drawings, per Section 16180 of these specifications. Furnish and install power, pilot, control and interlock wiring and terminations for the kitchen hood systems as required.

- B. Install all power, pilot, control and interlock wiring, and automatic control devices for system shut-down, as required, for the kitchen hood fire suppression system.

3.3 INSTALLATION OF KITCHEN AND BAR EQUIPMENT

- A. Connect, complete, ready for operation, all items of kitchen and bar equipment and kindred devices furnished under other Divisions of these Specifications and/or furnished by the owner.
- B. Outlets of various types and configurations have been indicated at equipment locations; however, rough-in drawings indicating the exact equipment and associated requirements shall be requested from the kitchen equipment suppliers and contractors and all loads, locations and requirements shall be verified and incorporated into the work of this section prior to commencement of installations.
- C. Provide and install cord-plug assemblies, as required, for kitchen and bar equipment.
- D. Certain items of kitchen equipment will be furnished prewired as a group to integral panelboards and/or terminal boards. Furnish and install electrical service to these points and make final connections thereto.

3.4 OTHER SUPPLIERS SYSTEM SHOP DRAWING

- A. Obtain a current, complete set of approved system shop drawing containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.

3.5 FINAL ADJUSTMENTS

- A. Upon completion of the Work, test all systems and components to insure that these systems and their components are functioning properly.
- B. Remove and replace components which have failed with identical units without additional compensation.
- C. Instruct Owner's personnel in the proper use and maintenance of equipment.

END OF SECTION

SECTION 16200

SWITCHBOARDS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work required under this section of the Specifications consists of the installation of all switchboards for use on systems 600 volts and below. All materials and devices which are an integral part of the switchboards shall be provided under this section of the Specifications.
- B. Switchboards as specified in these Contract Documents are free standing, dead-front, metal enclosed panels of one or more sections. The overcurrent devices may be individually or group mounted.

1.2 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Products of the following manufacturers, which comply with these Specifications, are acceptable:
 - 1. Square D
 - 2. Siemens
 - 3. Cutler Hammer
 - 4. General Electric
- B. Equipment Dimensions
 - 1. Dimensions noted on the Drawings are the maximum allowable and shall not be exceeded. Where switchboard(s) of acceptable manufacturers listed exceed the maximum dimensions, products of such manufacturers shall not be acceptable.
- C. Coordination
 - 1. Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to ensure access and so that clearance minimums are provided.

1.3 SUBMITTALS

- A. Refer to Section 16000 - Electrical General for submittal requirements.
- B. Shop Drawings: Submit shop drawings to indicate compliance with the Contract Documents.
 - 1. Include electrical characteristics and ratings for each switchboard with dimensions, mounting, bus material, voltage, bracing, ampere rating, mains, poles and wire connection, and any accessories.
 - 2. Include bussing diagram indicating each circuit breaker or fused switch position.
 - 3. Provide a schedule indicating overcurrent device, trip and size, poles, frame type, fuse size and type, or circuit breaker interrupting capacity.

1.4 **SHORT CIRCUIT AND COORDINATION STUDY**

- A. Overcurrent protective devices shall be selectively coordinated for distribution systems serving emergency and standby loads, as well as those serving multiple elevators, for faults with durations at 0.01 seconds.
- B. Manufacturer of switchboards and panelboards shall provide a short circuit and coordination study for:
 - 1. Distribution systems required to be selectively coordinated that contain circuit breakers.
 - 2. Distribution systems containing breakers with adjustable trip settings.
 - 3. Distribution systems requiring arc-flash analysis.

Where required for selective coordination purposes, the coordination study shall be included in the shop drawing submittals for the equipment.

1.5 **ARC FLASH SAFETY**

- A. The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D, and IEEE 1584 – Guide for Performing Arc Flash Hazard Calculations.
- B. Arc Flash Hazard Analysis
 - 1. Manufacturer of switchboards and panelboards shall provide an arc flash hazard analysis for the electrical distribution system. Include this study in the shop drawing submittals for the equipment.
 - 2. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
 - 3. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
 - 4. The flash protection boundary and the incident energy shall be calculated and reported at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
 - 5. The arc flash hazard analysis shall include all MV, 575v, and 480v locations and locations in 240 volt and 208 volt systems rated 400 amps and above.
 - 6. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
 - 7. The arc flash hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
 - 8. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
 - 9. Arc flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.
 - 10. The report shall indicate incident energy and flash protection boundary calculations as follows:
 - a. Arcing fault magnitude
 - b. Device clearing time
 - c. Duration of arc
 - d. Arc flash boundary
 - e. Working distance
 - f. Incident energy
 - g. Hazard risk category
 - h. Recommendations for arc flash energy reduction
- C. Arc Flash Warning Labels
 - 1. Contractor shall field-install arc flash labels on equipment that includes the available incident energy and required personnel protective equipment (PPE).
 - 2. The vendor shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

3. The label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following information:
 - a. Location designation
 - b. Nominal voltage
 - c. Flash protection boundary
 - d. Hazard risk category
 - e. Incident energy
 - f. Working distance
 - g. Engineering report number, revision number and issue date
 4. Labels shall be machine-printed, with no field markings.
 5. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings:
 - a. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided.
 - b. For each motor control center, one arc flash label shall be provided.
 - c. For each low voltage switchboard, one arc flash label shall be provided.
 - d. For each switchgear, one flash label shall be provided.
 - e. For medium voltage switches one arc flash label shall be provided.
 6. Labels shall be field-installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- D. Arc Flash Training
1. The equipment vendor shall train up to four (4) personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, shall be provided in the equipment manuals.

PART 2 PRODUCTS

2.1 GENERAL

- A. Furnish all materials specified herein.
- B. The switchboard, circuit breakers, and fused devices shall be UL Listed and bear the UL Label. Where a switchboard is utilized as service entrance equipment, it shall be UL Labeled as suitable for such use.
- C. The switchboard(s) shall be suitable for operation on the voltage system indicated on the Drawings.

2.2 STRUCTURE ARRANGEMENT

- A. The switchboard(s) shall consist of free-standing, standardized vertical sections bolted together to form a continuous structure.
- B. Adequate space for conduit and conductors entering the top or bottom, in accordance with the National Electrical Code, shall be provided without structural interference, conductors shall be safely accessible without disrupting service.
- C. The structure and all components shall be finished in the manufacturer's standard corrosive-resistant primer and coating.
- D. Unless noted otherwise, switchboard sections shall be front accessible.

2.3 BUS ARRANGEMENT

- A. All busses shall be tin-plated aluminum, rated for a 65 degrees C temperature rise above a 40 degrees C ambient. The minimum bus bracing, in RMS-symmetrical-amperes, shall be as shown on the Drawings.

- B. A neutral bus bar shall be provided, rated 100% of the main phase bus bar ampacity.
- C. The main bus shall be fully rated for the entire length of the switchboard.
- D. All non-current-carrying parts of the switchboard shall be grounded through the use of a continuous horizontal ground bus connected to vertical ground busses in each section. Ground bus rating shall meet or exceed the ampacity of the electrical service grounding electrode conductor(s).
- E. An accessible cable termination compartment shall be provided for incoming line termination for main lug only applications. Lugs shall be suitable for terminating the size and quantity of conductors as indicated.
- F. All terminal lugs shall be UL Labeled for AL or CU conductors rated for 75 degrees C.

2.4 MAIN PROTECTIVE DEVICE(S)

- A. The main protective device(s) shall employ fixed type mounting. The devices shall be individually mounted in the switchboard.
- B. Provide molded case circuit breaker(s)
 1. Breaker(s) shall be 600V AC, 50/60 HZ rated. The frame and current ratings shall be as indicated on the Drawings.
 2. Circuit breaker(s) shall be of the quick-make, quick-break, trip-free thermal magnetic type.
- C. Provide insulated case circuit breaker(s)
 1. Breaker(s) shall be 600V AC, 50/60 HZ rated. The frame and current ratings shall be as indicated on the Drawings.
 2. Circuit breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous, and ground-fault pickup and delay. Fault indication shall be provided on the trip unit for overload, short time, short circuit, and ground fault conditions.
 3. Breaker(s) must carry a UL 429 Listing, be rated for 100% continuous duty, approved for reverse connection, and shall be stationary mounted, suitable for manual operation. Breaker(s) must carry an individual serial number with factory-maintained production and test records.
 4. The breaker operating mechanism shall be a true two-step stored energy mechanism that shall provide a five cycle maximum closing time. Separate indicators shall be provided to show charged/discharged status of the mechanism and open/closed status of the breaker's contacts. The breaker mechanism shall enable to be discharged without closing the main contacts. The manual charging handle shall be interlocked with the manual close button to prevent simultaneous operation.
- D. Provide fused switch(es)
 1. Switch(es) shall be 600V AC, 50/60 HZ rated and shall be UL Listed for application at 100% of their continuous current rating. The current rating shall be as indicated on the Drawings.
 2. Switch(es) shall be bolted pressure contact, load interrupting, fast-acting stored energy type, fused devices. The contact interrupting capacity shall be 12 times the continuous current rating and 200,000 AIC for the combination of switch and fuse. The switch shall have electrical trip mechanism.
 3. Fast-acting current limiting fuses shall be installed in each ungrounded leg of the switch.
 4. Switch shall be equipped with "blown fuse" protection to automatically trip switch upon loss of any fuse.
 5. Switch shall be equipped with factory installed ground fault sensing system and indication.
- E. Provide phase-loss protection
 1. Phase loss protection system shall trip the main disconnect device(s) under single-phase condition or a voltage imbalance of 12% or more.

2. The system shall not trip on total loss of voltage on all phases and shall have a built-in time delay with a range of 3 - 12 seconds. Capacitor trip component is required.
3. The system shall be equipped with LED fault indicators installed on the front of switchboard enclosure.

2.5 DISTRIBUTION PROTECTIVE DEVICES

- A. Provide molded case circuit breakers
1. Circuit breakers shall be provided with trip rating, poles and minimum interrupting rating as indicated on the Drawings or specified herein.
 2. Circuit breakers 600 amps or less shall be of the quick-make, quick-break, trip-free thermal magnetic type.
 3. Circuit breakers greater than 600 amps shall be of the quick-make, quick-break, trip-free, solid state type. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous, and ground-fault pickup and delay.
 4. Circuit breakers shall be bolted to the switchboard bus.
 5. Provide shunt trip device to electrically trip circuit breakers where indicated on the Drawings.

2.6 AUXILIARY EQUIPMENT

- A. Identification
1. Refer to Section 16000 - Electrical General for nameplate requirements.
- B. Provide surge protective devices (SPD) integral to the switchboard assembly complying with the following:
1. SPD shall be listed and component recognized in accordance with UL 1283 and UL 1449 Third Edition.
 2. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory as an integral device to the electrical equipment.
 3. SPD shall provide surge current diversion paths for all modes of protection; L-L, L-N, L-G, N-G in WYE systems (L-N or L-G if at service entrance with bonding jumper), and L-L, L-G in DELTA systems.
 4. SPD shall be modular in design. Each module shall be fused with a surge rated fuse and incorporate a thermal cutout device.
 5. A UL approved disconnect switch shall be provided as a means of disconnect in the switchboard device only.
 6. SPD shall meet or exceed the following criteria:
 - a. Maximum surge current capability (single pulse rated) shall be 120 KA per mode.
 - b. Nominal discharge current rating shall be 20 KA.
 - c. MCOV shall not be less than 125% of the nominal system operating voltage.
 - d. The maximum ANSI/UL 1449 3rd Edition voltage protection rating for the device shall not exceed the following:
- | Modes | 208Y/120 | 480Y/277 |
|---------------|----------|----------|
| L-N; L-G; N-G | 700 | 1200 |
| L-L | 1200 | 2000 |
7. SPD shall have successfully passed ANSI/IEEE C62.41-1991 10 x 1000 μs waveform testing performed by a nationally recognized independent test lab.
 8. SPD shall have a minimum EMI/RFI filtering of -50dB at 100 kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.
 9. SPD shall be provided with 1 set of NO/NC dry contacts.
 10. SPD shall have a warranty for a period of five years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the

warranty period. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install switchboard on 3" high concrete pad, the horizontal dimensions of which shall exceed the base dimensions of the switchboard by 3" on all sides.
- B. Lace and group conductors installed with nylon tie straps. Only one conductor shall be installed under each terminal. Form and train conductors in enclosure neatly parallel and at right angles to sides of box. Un-insulated conductor shall not extend beyond 1/8" from terminal lug.
- C. Do not splice conductors in switchboard. Where required, install junction box adjacent to enclosure and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specifications and do not exceed.
- D. Maintain conductor phase color code requirement described in the conductors and cables section of the Specifications.
- E. Switchboard name/designation shall be labeled per the requirements of Section 16000 - Electrical General 2.02 A, as well as each individual feeder breaker/fused switch and branch circuit breaker/fused switch.
- F. Any circuit breaker provided with arc energy reducing maintenance switch shall be labeled "BREAKER IS PROVIDED WITH ARC ENERGY REDUCING MAINTENANCE SWITCH". Labeling shall be per the requirements of Section 16000 – Electrical General 2.02A.

3.2 CLEANING AND ADJUSTMENT

- A. After completion, clean the interior and exterior of dirt, paint and construction debris.
- B. Circuit breaker adjustments shall be performed as directed by the Engineer at projection completion.

END OF SECTION

SECTION 16255

DIMMER PANEL

PART 1 GENERAL

- 1.1 ADMINISTRATIVE DATA AND PROCEDURES
- A. This specification details the equipment necessary for a dimming control system.
- 1.2 SUMMARY
- A. Section includes: eight-channel dimming control system
- 1.3 REFERENCES
- A. Underwriters Laboratories (UL) – www.ul.com
B. Canadian Standards Association (CSA) – www.csa.ca
C. ETL SEMKO – www.intertek-etlsemko.com
D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) – www.ashrae.org
- 1.4 SUBMITTALS
- A. Submittal drawings: provide a set of six shop drawings for approval. Include a dimming control system block diagram, controllers, and system dimensions.
B. Operation manuals: provide manuals describing installation procedures and controller operation prior to or upon product delivery.
- 1.5 QUALITY ASSURANCE
- A. System must meet UL 1472 standards.
B. System must meet CSA C22.2 No. 184.1-96 standards.
C. Manufacturer must have been producing lighting control equipment for at least ten years.
D. Manufacturer of specified dimming control system must also be manufacturer of dimmer cabinets and modules used in the system.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Provide a checklist of components included with the shipment of the dimming control system.
- 1.7 PROJECT/SITE CONDITIONS
- A. System must be installed indoors, in a designated electrical closet.
B. The ambient temperature of the installation space must not exceed 122°F or fall below 0°F.
C. The dimming control system installation space must not be exposed to water, steam, or heavy moisture.
- 1.8 WARRANTY
- A. Provide a three-year limited warranty on parts.
B. Provide a one-year limited warranty on labor.
C. Provide a warranty that begins 90 days after the dimming control system's manufacture date, indicated by the system's manufacture date stamp.
- 1.9 MAINTENANCE
- A. Do not provide a system with any moving parts, including fans.

PART 2 PRODUCTS

2.1 NAMES

- A. Stellar Mini Panel 8 (SMP8): dimming control system with up to eight dimmer modules.
- B. Stellar Mini U-Dimmer: universal dimmer module compatible with incandescent lighting, neon/cold cathode lighting, ceiling fans, two-wire and three-wire dimmable electronic fluorescent ballasts, and non-dim loads.
- C. Stellar Mini E-Dimmer: electronic fluorescent ballast dimmer compatible with 0-10 VDC and 3-12 VDC dimmable electronic fluorescent ballasts.

2.2 MANUFACTURERS

- A. Marlin Controls, Inc.
11011 Regency Crest Drive, Suite 200
Dallas, TX 75238
800-788-5750
214-553-1011 (fax)
www.marlincontrols.com
- B. Voluntary product substitutions cannot be made without prior approval by the lighting and control equipment specifier.
- C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

2.3 COMPONENT(S)

- A. Enclosure
 - a. Provide a cover made of 0.090" 5052H-32 anodized aluminum.
 - b. Provide a base plate made of 0.090" 5052H-32 black anodized aluminum.
 - c. Provide a base plate with four keyhole mounts.
 - d. Do not use any fans. Provide a convection-cooled enclosure.
 - e. Do not provide a system larger than 16.125" x 12.375" x 5.125", including the cover of the dimming system.
 - f. Do not provide a system exceeding 12 pounds.
 - g. Include five 0.75"/1"-diameter top-feed knock-outs to allow connections for conduits.
- B. Power distribution block
 - a. Provide a system that accepts inputs of 120, 240, or 277 VAC.
- C. Control interface
 - a. Provide a control interface that contains an RS-485 interface.
 - b. Provide a control interface with a 12 VDC output.
 - c. If necessary, provide a control interface that accepts the DMX512 protocol, upon request.
- D. Universal dimmers and electronic fluorescent ballast dimmers
 - a. Provide dimmers with a dimmer rating of 1800 W, with no required minimum load, and a 100% duty cycle.
 - b. Provide dimmers with a triac power regulation device.
 - c. Provide dimmers with a 100% linear dimming curve.
 - d. Provide dimmers with a user-selectable low-end cutoff from 0% to 45%, in 5% increments.
 - e. Provide assignable 8-bit physical addresses between 0 and 255 for each dimmer module.
 - f. Store 16 presets in the dimmer module's flash memory. Back up presets in case of power outages. Provide more presets upon request.
 - g. Revert to the last active preset when power is restored after a power outage.
 - h. Provide a unique fade rate for each preset.
 - i. Provide a black anodized aluminum heat sink for each dimmer module.
 - j. Provide a two-way communicating dimmer module that sends light level, fade rate, and preset information to controllers on the dimming control network.

- k. Provide a dimmer module that is reconfigurable as a non-dim relay, either by dip switch configuration or by hardwiring of the load to a different position of the power distribution block.
- E. Universal dimmers
 - a. Provide a dimmer that is compatible with incandescent lamps, neon and cold cathode lighting, ceiling fans, line voltage dimmable electronic fluorescent ballasts, and non-dim loads.
 - b. Make universal dimmers interchangeable with electronic fluorescent ballast dimmers.
- F. Electronic fluorescent ballast dimmers
 - a. If necessary, provide a dimmer that is compatible with 0-10 VDC and 3-12 VDC dimmable electronic fluorescent ballasts and non-dim loads, upon request.
 - b. Make the dimmer user-configurable for switching between 0-10 VDC and 3-12 VDC loads.
 - c. Make electronic fluorescent ballast dimmers interchangeable with universal dimmers.

2.4 FABRICATION

- A. Use UL 105-compliant tin-plated wire throughout the entire dimming control system.
- B. Do not leave any stranded wire exposed. Cover and crimp each stripped wire end with a titanium ferrule.

2.5 MANUFACTURER OR SUPPLIER QUALITY CONTROL

- A. Test the fully assembled dimming control system with included controllers, with full loads, for a minimum of four hours.
- B. Test each dimmer individually prior to assembling the dimming control panel.
- C. Include a date stamp on each dimmer module indicating the assembly date.
- D. Include a date stamp on each dimming control system indicating the manufacture date.
- E. Include a date stamp on each dimming control system indicating the test date.
- F. Maintain testing documentation for each dimming control system including the test date, test start and end times, name of person conducting the test, and notes of any troubleshooting performed on the dimming control system. Provide testing documentation upon request.

3.1 NAMES

- A. Stellar RCS II: 96-zone lighting controller with manual light level adjustment and 8 scene presets.

3.2 MANUFACTURERS

- A. Marlin Controls, Inc.
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- C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

3.3 COMPONENT(S)

- A. Lighting controller
 - a. Provide a controller capable of controlling up to 96 channels and storing/recalling 8 scene preset switches with LED indicator.
 - b. Provide preprogrammed "on" and "off" switch with LED indicator.
 - c. Back up all preset information in the controller. Synchronize the data with dimmer modules when the controller or dimmers are replaced.
 - d. Allow an adjustable fade rate for each preset, in seconds, between 0 and 90, or in minutes, between 0 and 90.
 - e. Use a numeric display to show the currently active preset and fade rate or selected zone and light level.
 - f. Require a password to be entered before preset programming to prevent tampering.
 - g. Include a switch that locks or unlocks preset programming to prevent tampering.
 - h. Provide four dry contact closure inputs for motion sensors, door switches, alarm systems, or other interfaces.
 - i. Provide a 2-gang masonry Raco #696 switch box (3-25/32" W x 3-3/4" H x 3-1/2" D).
 - j. Provide a faceplate with no visible mounting screws.
 - k. Provide a faceplate with custom colors, graphics, and type.

4.1 NAMES

- A. Hercules Programmable Controller: lighting controller for recalling eight preset scenes (plus preprogrammed "on" and "off" presets) and toggling up to 96 external relays. Provides scheduling of presets and relays by time or outdoor photocell sensor.

4.2 MANUFACTURERS

- A. Marlin Controls, Inc.
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- B. Voluntary product substitutions cannot be made without prior approval by the lighting and control equipment specifier.
- C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

4.3 Component(s)

- A. Lighting controller
 - a. Provide a controller capable of recalling eight dimming scene presets and preprogrammed "on" and "off" presets.
 - b. Allow manual and automatic switching of up to 96 external relays.
 - c. Allow time scheduling of presets and relays to activate scenes or switch relays automatically, with daily, weekly, weekday-only, or weekend-only recurrences.
 - d. Provide an astronomical time clock for scheduling presets or switching relays at the time of sunrise or sunset, or at some offset up to 5 hours and 59 minutes before or after sunrise or sunset.
 - e. Allow photocell scheduling of presets to activate scenes or toggle relays automatically depending on the reading of the outdoor photocell.
 - f. Provide customizable photocell delay and tolerance settings to adjust the photocell's sensitivity to lightning or other momentary outdoor light changes.
 - g. Include a backlit LCD to display the active preset, status of external lighting, and photocell reading.

- h. Provide different levels of access to controller settings with configurable user-level and admin-level passwords. Restrict user-levels to manual control of presets and relays. Allow admin-levels access to setting time schedules, photocell schedules, and controller configuration.
- i. Provide four inputs for door switches, occupancy sensors, or fire/security alarm outputs.
- j. Provide a skip-a-day function to allow the user to disable time scheduling for single days, days of the week, or holidays.
- k. Provide user-programmable holidays to skip time and photocell scheduling.
- l. Minimize in-rush current by switching multiple relays with a time delay between each relay, configurable by the user between 0 ms and 240 ms.
- m. Back up all schedules and configuration data permanently with on-board memory.
- n. Back up the time clock with an on-board rechargeable lithium battery.
- o. Provide a controller that performs an all-off sweep one to five hours after a manual override, for compliance with Title 24 of the California Energy Commission (2005). Allow user to specify active off-sweep hours and warn occupants by flashing lighting before the sweep occurs.
- p. Provide a 2-gang masonry Raco #696 switch box (3-25/32" W x 3-3/4" H x 3-1/2" D).
- q. Provide a faceplate with no visible mounting screws.
- r. Provide a faceplate with custom colors, graphics, and type.

5.1 NAMES

- A. DC II Relay Board: relay board with eight 10-amp relays.

5.2 MANUFACTURERS

- A. Marlin Controls, Inc.
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- B. Voluntary product substitutions cannot be made without prior approval by the lighting and control equipment specifier.
- C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

5.3 COMPONENT(S)

- A. Relay contacts
 - a. Provide a relay board with eight relay outputs.
 - b. Provide eight normally open/normally closed relays with a rating of 10 A at 240 VAC or 8 A at 24 VDC.
 - c. Include an LED status indicator for each relay.
 - d. For automatic relay switching, include eight 12 VDC inputs for garage door openers, security alarms, and other automatic devices.
 - e. Provide an RS-485 interface to the rest of the lighting control network, and two RS-485 pin connectors for expansion of up to 12 relay boards.
 - f. Provide a dip switch for configuring momentary relay contacts with time delays.
 - g. Provide a dip switch for address configuration.
 - h. Store each relay's status in non-volatile memory to restore the status of controlled devices in case of a power outage.
 - i. Enclose the relay board in a 12" x 12" x 4" steel enclosure.

6.1 NAMES

- A. PHC: interface to the dimming control system for detecting outdoor sunlight levels.

6.2 MANUFACTURERS

- A. Marlin Controls, Inc.
11011 Regency Crest Drive, Suite 200
Dallas, TX 75238
800-788-5750
214-553-1011 (fax)
www.marlincontrols.com
- B. Voluntary product substitutions cannot be made without prior approval by the lighting and control equipment specifier.
- C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

6.3 COMPONENT(S)

- A. Photocell interface
 - a. Provide lighting controllers that detect the photocell's reading and recall presets accordingly.
 - b. Protect the photocell with an epoxy coating and a hood to house the sensor.
 - c. Mount the photocell on the roof, facing north.

PART 3 EXECUTION

7.1 INSTALLATION

- A. The electrical contractor must install the system according to the manufacturer's provided instructions. Failure to do so will void the limited warranty.
- B. Install the dimming control system in a dedicated electrical closet or room free of water and heavy moisture.
- C. Provide four keyhole mounts on the base of the system for surface mounting.

7.2 INTERFACE WITH OTHER PRODUCTS

- A. Use shielded, four-conductor, 20-gauge Belden 9402 low-voltage control cable to interface the dimming control system with other controllers, per manufacturer's instructions.
- B. Use shielded, four-conductor, 20-gauge Belden 9402 low-voltage control cable to interface the dimming control system with DMX512 control equipment.

END OF SECTION

SECTION 16400

SURGE PROTECTIVE DEVICES (SPD)

PART 1 GENERAL

1.1 DESCRIPTION

- A. These specifications describe the electrical and mechanical requirements for a hybrid high-energy power conditioning filter incorporating surge protective devices and high-frequency electrical line noise filtering. The specified unit shall provide effective high-energy surge protection, surge current diversion, high-frequency attenuation, and line control in ANSI/IEEE C62.41.1-2002 environments connected on the load side of the facility's meter or main overcurrent device. The unit shall be connected in parallel with the facility's wiring system.

1.2 QUALITY ASSURANCE

- A. The requirements of the following standards shall become a part of this Specification by reference:
1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41.1-2002, C62.41.2-2002, and C62.45-2002)
 2. Canadian Standards Association (CSA)
 3. Federal Information Processing Standards Publication 94 (FIPS PUB 94)
 4. National Electrical Manufacturers Association (NEMA)
 5. National Fire Protection Association (NFPA 70 (NEC), 75 and 78)
 6. Underwriters Laboratories Inc. (UL 1449 3rd Edition and 1283)
The unit shall be UL and cUL 1449 3rd Edition Listed as a Surge Protective Device.
- B. Acceptable Manufacturers
1. Current Technology
 2. Thor Systems
- C. Testing: The unit shall be thoroughly factory-tested before shipment. Testing of each unit shall include but shall not be limited to quality assurance checks, MCOV and clamping voltage verification tests.
- D. Warranty: The manufacturer shall provide a minimum 5-year warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.
- E. Submittal Documentation: Documentation of unit's UL 1449 3rd Edition Voltage Protective Rating (VPR) shall be included as required product data submittal information. Manufacturer shall make available upon request certified documentation of applicable Location Category Testing in full compliance with ANSI/IEEE C62.41.1-2002, C62.41.2-2002, and C62.45-2002 Guidelines. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the specified unit. Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

PART 2 PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENT

- A. The unit shall provide all modes of protection: line to neutral, line to ground, and neutral to ground.

- B. High Frequency Tracking Filter: The unit shall include a UL1283 high-frequency extended range tracking filter. The filter shall reduce fast rise-time, high-frequency, error producing transients and electrical line noise to harmless levels, thus eliminating disturbances which may lead to system upset.
- C. Unit Status Indicators: The unit shall include solid-state, long-life, externally mounted LED visual status indicators that indicate the status of MOV fusing.
- D. Transient Counter: Front cover mounted transient counter (LCD or LED) shall totalize surges for all modes.
- E. Nominal discharge current rating shall be I_n 20 kA.
- F. Minimum SPD fault current ratings shall be 100Kaic.

PART 3 APPLICATIONS

3.1 SERVICE ENTRANCE/MAIN DISTRIBUTION APPLICATIONS

- A. The following table will indicate appropriate model numbers based on the electrical system ampacity. Surge current ratings are based on the Site Shield Risk Assessment Spreadsheet (TSI 067 3gSSH/r3).
- B. SPDs connected to service equipment shall be listed as a type 1 SPD per UL1449 3rd Edition and shall have integral disconnect switch, and shall be connected to bus on the load side of the main switch.

SERVICE ENTRANCE/MAIN DISTRIBUTION APPLICATIONS					
Manufacturers' Models			Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
Current Tech	Thor Systems	Emerson/ APT		Per Mode	Per Phase
TG 300	TSrc 300	460 30	4000 – 6000A	300	600
TG 250	TSrc 250	460 30	2000 – 3000A	250	500
TG 200	TSrc 200	460 20	1200 – 1600A	200	400
TG 150	TSrc 150	460 15	600 – 1000A	150	300
TG 100	TSrc 100	460 10	125 – 400A	100	200

3.2 PANELBOARDS AND BRANCH PANEL APPLICATIONS

- A. As indicated on the Drawings, provide a panelboard with externally mounted SPD with high-frequency filtering per requirements listed in this specification. Provide number of breakers, voltage/phases as indicated on the Drawings. SPD shall physically connect to the top or bottom of panelboard allowing for SPD to be repaired or replaced without opening the dead front of the panelboard.
- B. SPDs connected to Panelboards or Branch Panels shall be listed as a type 1 or type 2 SPD per UL1449 3rd Edition and shall be circuit breaker connected.
- C. The following table indicates appropriate model numbers based on the electrical system ampacity. Surge current ratings are based on Site Shield Risk Assessment Spreadsheet (attached #TSI 067 3gSSH/r3). SPDs connected to Panelboards and Branch Panels shall be listed as a type 1 or type 2 SPD per UL 1449 3rd Edition and shall be 30 Amp circuit breaker connected.

PANELBOARDS AND BRANCH PANEL APPLICATIONS					
Manufacturer/Model Nos.			Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
Current Tech	Thor Systems	Emerson/ APT		Per Mode	Per Phase
EGPE2	TSnc 150	440 15	600A	150	300

150					
EGPE2 100	TSnc 100	440 10	125 – 400A	100	200
EGPE2 60	TSnc 050	440 05	Up to 100A	50	100

PART 4 EXECUTION

4.1 INSTALLATION

- A. Install wiring connection to distribution system as indicated on the Drawings. Wiring length should be kept to an absolute minimum (3' or less) and be as straight as possible.
- B. Wire sizes to Service Entrance/Main Distribution SPD should be 4#6, 1#6 G - 1" conduit.
- C. Wire sizes to Panelboard and Branch Panel SPD should be as indicated 4#10, 1#10G – ¾" conduit.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work required under this section of the Specifications consists of furnishing, installation and connections of the building grounding system. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be 3-phase, 4-wire, grounded, wye system supplemented with equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.2 REGULATORY REQUIREMENTS

- A. Install a complete grounding system in accordance with the National Electrical Code.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide all materials under this section of the specifications.
- B. All materials shall be new, UL Listed, and bear a UL Label.
- C. Refer to Section 16120 - Conductors for conductor specification.

2.2 GROUNDING CONDUCTORS

- A. Grounding electrode conductor shall be bare or green insulated copper conductor sized as indicated on the Drawings.
- B. Equipment grounding conductors shall be green insulated conductors sized as indicated on the Drawings. Where size is not indicated on the Drawings, conductor size shall be determined from the National Electrical Code table on sizes of equipment grounding conductors.
- C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code tables for grounding electrode conductors.

2.3 PANELBOARDS, TRANSFORMERS, AND DISCONNECT SWITCHES

- A. Provide each low voltage distribution and branch circuit panelboard with a copper equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar.
- B. Provide a conductor termination grounding lug bonded to the enclosure of each equipment item.

2.4 DEVICES

- A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame.

2.5 GROUND RODS

- A. Ground rods shall be 3/4" x 10'-0" copper clad steel.

PART 3 EXECUTIONS

3.1 INSTALLATION

- A. Ground all non-current carrying parts of the electrical system including raceways, equipment frames and enclosures, outlet boxes, junction boxes, and other conductive material in close proximity with electrical circuits.
- B. Service entrance and separately derived electrical systems, grounding electrode system
 1. The grounded conductor(s) of the electrical service serving the premises wiring system shall be connected to the neutral bus bar in the service equipment which shall be grounded to the cold water system, the ground rod system, and other grounding electrodes specified herein or indicated on the Drawings. Grounding electrode conductors shall be installed rigid, nonmetallic conduit to point of ground connection, unless subject to physical damage in which case it shall be installed in galvanized rigid steel.
 2. Make connection to main water line entering the building. Make connections ahead of any valve or fittings whose removal may interrupt ground continuity.
 3. Bond together the following systems to form the grounding electrode system. All system connections shall be made to the electrodes as close as possible to the service entrance equipment and each connected at the service entrance equipment neutral bus. Do not connect electrode systems together except at neutral bus.
 - a. Cold water piping system
 - b. Ground rod system
 - c. Rebar in concrete footing
 - d. Structural steel metal building frame
 4. Ground the neutral of all dry type transformers to either building steel or a common grounding electrode conductor connected to a service ground. Transformers shall be bonded to the nearest available point on the interior water piping system. In reinforced concrete structures building steel shall be considered to be reinforcing steel of vertical columns.
 5. Grounding electrode connections to structural steel, reinforcing bars, ground rods, or where indicated on the Drawings shall be with chemical exothermic weld connection devices recommended for the particular connection type. Connections to piping shall be with UL Listed mechanical ground clamps.
 6. Where there is more than one service to a building or interconnected buildings, services shall be connected by means of a grounding electrode conductor.
 7. Bonding shall be in accordance with the National Electrical Code.
 8. Install ground rods where indicated on the Drawings with the top of the ground rods 12 inches below finished grade.
- C. Equipment Grounding Conductor
 1. Grounding conductors for branch circuits are not shown on the Drawings; however, grounding conductors shall be provided in all branch circuit raceways and cables.
 2. Grounding conductors for feeders are typically indicated on the Drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the Drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.
- D. Other Grounding Requirements
 1. Each telephone backboard shall be provided with a No. 6 grounding conductor. When backboard is located in vicinity of electrical service equipment, the "point of grounding" of this conductor shall be the main cold water service with connections made ahead of any valves or joints. Remote backboards shall use building steel as "point of ground." Terminate conductor by stapling to backboard.
 2. At each building expansion joint flexible copper bonding jumpers shall be attached to building structure by chemical weld process. Install bonding jumpers

in concealed locations that will not subject connections or jumpers to physical abuse. Install 100' on centers across expansion joints.

3.2 TESTING

- A. Upon completion of the ground rod installation, the Contractor shall test the installation in accordance with the "Electrical Testing" section of Section 16000 - Electrical General. Grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within 48 hours of rainfall.

END OF SECTION

SECTION 16500

LIGHTING

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section specifies the lighting system requirements.
- B. All fixtures shall be current source, provided with lamps ready to use.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to another division for the ceiling systems.
- B. Lighting system shall be coordinated with the ceilings.

1.3 SUBSTITUTIONS/VALUE ENGINEERING/PRICING

- A. Substitution/value engineering requests shall be accompanied by complete manufacturers data with model numbers, cut sheets with options indicated, and a full photometric report. For exterior lighting, a computer generated point by point calculation shall be provided.
- B. All substitution requests shall be submitted in completion to Engineer at least 10 days prior to bid date.
- C. Pricing for lighting fixtures shall be separate from pricing for lighting controls (occupancy sensors, relay controls, dimming).

PART 2 PRODUCTS

2.1 BALLASTS

- A. All fluorescent lamp ballasts shall be low-loss, high power factor Class "P," with "A" sound rating and shall bear UL and CBM certifications. Ballast case temperature shall not exceed 90 degrees C.
- B. All fluorescent fixtures shall be equipped with program-start ballasts. Multi-lamp ballasts shall be parallel-wired.
- C. Linear and compact fluorescent lamp ballasts shall be electronic by Advance, General Electric, Osram Sylvania, or Universal.
- D. All HID lighting fixtures shall have a high power factor, regulated output ballast provided by the fixture manufacturer, pre-wired with a glass tube fuse holder and fuse on each primary hot lead.

2.2 LAMPS

- A. Fluorescent lamps shall be energy saving type, 3,500 degrees K, CRI 75, of size and wattage as scheduled on the Drawings, unless noted otherwise on Light Fixture Schedule. They shall be General Electric or equal as manufactured by Sylvania or Philips unless indicated otherwise on Drawings. Lamps shall have a rated life of 20,000 hours minimum at three (3) hours per start.
- B. Incandescent lamps shall be of type, size and voltage as scheduled on the Drawings. Lamps shall be of the extended service type with a rated life of 2,500 hours. Reflector lamps (R and PAR) shall have a rated life of 2,000 hours for the standard type and 4,000 hours for the "Quartz" or "Krypton" types. Quartz lamps shall be clear with a rated life of 2,000 hours.

2.3 LIGHTING FIXTURES

- A. Letter designations beside outlet symbols on Drawings correspond to letter designations in Lighting Fixture Schedule.
- B. Recessed incandescent fixtures, where used in an insulated ceiling, shall be equipped with thermal protection and shall bear the UL Label indicating the suitability for such use.
- C. Lens material for recessed fluorescent fixtures shall be 100% virgin acrylic, 0.125" thick in a square prism pattern similar to KSH-K-12 or as scheduled in Lighting Fixture Schedule.
- D. Site lighting poles shall meet or exceed the local wind loading requirements of authority having jurisdiction.
- E. Concrete pole bases shall be required for site lighting poles.
- F. Recessed lighting fixtures installed in the building thermal envelope (e.g. attic) shall be IC rated and labeled with enclosures that are sealed and gasketed to limit air leakage between conditioned and non-conditioned spaces.
- G. All linear fluorescent lighting fixtures (with double-ended lamps) shall have a factory-installed, concealed disconnecting means for each ballast.

PART 3 EXECUTION

3.1 LIGHTING FIXTURES

- A. Provide lighting fixtures at all locations indicated by distinctive symbols or notes on the Drawings.
- B. Lighting fixtures shall be secured to ceiling grid with clips or screws and two #12 steel wires mounted to opposite corners of light fixture secured to structure.
- C. Locations of lighting fixtures on the electrical drawings are approximate. Refer to Architectural reflected ceiling plan for actual locations of fixtures and mounting heights.
- D. Lighting fixtures installed in plaster and stucco ceiling shall have plaster frame and shall be of the flanged type.
- E. Fixtures recessed in concealed-spline tile and in gypsum board ceilings shall be flanged.
- F. Surface or recessed fixtures in or on plastered ceilings shall be supported from pieces of support channel spanning across the main supporting channels and shall not depend on the metal lath for support.
- G. Each recessed lighting fixture shall have a trim to match the type of ceiling (exposed grid, metal panel, etc.) in which it is being installed, except where noted otherwise on the plans.
- H. Each lighting fixture recessed in a concrete wall shall have a junction box or wiring compartment provided inside the fixture housing. Provide conduit access into the fixture concealed.

END OF SECTION

SECTION 16520

OCCUPANCY SENSORS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The Contractor's work shall include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
- B. The Contractor/supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.
- C. The Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.2 EQUIPMENT QUALIFICATION

- A. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
- B. All components shall be UL Listed, offer a 5-year warranty and meet all state and local applicable code requirements.
- C. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
- D. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.3 SYSTEM DESCRIPTION

- A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
- C. The Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the Owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the Owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.4 SUBMITTALS

- A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.
- B. Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor.
- C. Submit any interconnection diagrams per major subsystem showing proper wiring.
- D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

- E. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.5 SYSTEM OPERATION

- A. It shall be the Contractor's responsibility to make all proper adjustments to assure Owner's satisfaction with the occupancy system.

1.6 ACCEPTABLE MANUFACTURERS

- A. The Watt Stopper, or Pre-Approved Equal: For pre-approval, provide all the information listed under section 1.04 A and 1.04 D a minimum of ten (10) working days prior to initial bid date.
- B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

PART 2 PRODUCTS

2.1 GENERAL

- A. All products shall be Watt Stopper product numbers.
 - 1. Ceiling Sensors: WT-605, WT-600, WT-1105, WT-1100, WT-2205, WT-2200, WT-2250, WT-2255, W-500A, W-1000A, W-2000A, W-2000H, WPIR, DT-200, DT-205, CX-100, CX-105, CI-200, CI-205.
 - 2. Wall Sensors: WI-200, WS-120/277, WA-100, WD-170, WD-180, WD-270, WD-280.
 - 3. Power and Slave Packs: B120E-P, B277E-P, C120E-P, C277E-P, S120/277-P, AT-120.
 - 4. HID Control: DM-100.
 - 5. Outdoor Sensors: EW-100, EW-200, EN-100, EN-200.
 - 6. Low Temperature: CB-100.
 - 7. InteleSwitch: TS-200, TS-300, TS-200-24.
- B. Wall switch sensors shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.
- C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,200 watts at 277 volts and shall have 180 degrees coverage capability.
- D. Wall switch products shall utilize Zero Crossing Circuitry, which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- E. Wall switch sensors shall have no leakage current to load, in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.
- F. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.
- G. Where specified, vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0 mm thickness. Products utilizing a soft lens will not be considered.
- H. Passive infrared sensors shall utilize Pulse Count Processing and Digital Signature Analysis to respond only to those signals caused by human motion.
- I. Passive infrared sensors shall utilize mixed signal ASIC which provides high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line), superior performance, and greater reliability.
- J. Passive infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.
- K. Where specified, passive infrared and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.
- L. Dual technology sensors shall be corner mounted to avoid detection outside the controlled area when doors are left open.

- M. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.
- N. Ultrasonic sensors shall utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
- O. Ultrasonic operating frequency shall be crystal controlled at 25 kHz within + 0.005% tolerance, 32 kHz within + 0.002% tolerance, or 40 kHz + 0.002% tolerance to assure reliable performance and eliminate sensor crosstalk. Sensors using multiple frequencies are not acceptable.
- P. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.
- Q. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
- R. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Setting shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
- S. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
- T. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
- U. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
- V. All sensors shall have UL rated, 94V-0 plastic enclosures.
- W. Outdoor motion sensors shall have UL 773A ratings. EWF outdoor sensors shall additionally have UL 1571 ratings.
- X. EW-100 outdoor sensors shall cover up to 35 feet, with a field of view of 180 degrees. EW-200 outdoor sensors shall cover up to 52.5 feet, with a field of view of 270 degrees. EN-100 outdoor sensors shall cover up to 35 feet, with a field of view of 90 degrees. EN-200 outdoor sensors shall cover up to 100 feet, with a long range lens view.
- Y. EWF outdoor sensors shall include polycarbonate lamp holders that accept PAR 20 or 38 lamps up to 150W per lamp.
- Z. Outdoor sensors shall have an operating temperature range of -40 degrees F to +130 degrees F.
- AA. To ensure complete protection from weather elements and exposure, outdoor sensors shall be manufactured with precision double-shot tooling and contain internal silicon gaskets.
- BB. HID controller shall be compatible with all types of High Intensity Discharge (HID) lamps, including Metal Halide, Metal Halide Pulse Start, and High Pressure Sodium.
- CC. HID controller shall operate with HID lamps utilizing Constant Wattage Autotransformer (CWA) type ballasts.
- DD. To avoid lamp damage during the HID power up period, the HID controller shall maintain a full light level during lamp warm up for 15 minutes.
- EE. To maximize lighting control scenarios, the HID controller shall be compatible with any 24 VDC controlling device, such as occupancy sensors, time switches, control panels, or photocells.
- FF. The HID controller shall be capable of linking to other HID control modules to enable effective multi-zone control. More than 100 individual devices shall be capable of being connected.

2.2 CIRCUIT CONTROL HARDWARE – CU

- A. Control Units: For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control unit shall provide power to minimum of two (2) sensors.
- B. Relay Contacts shall have rating of:
 - 13A - 120 VAC Tungsten
 - 20A - 120 VAC Ballast
 - 20A - 277 VAC Ballast
- C. Control wiring between sensors and controls units shall be Class II, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.
- D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

PART 3 EXECUTIONS

3.1 INSTALLATION

- A. It shall be the Contractor's responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have 90 to 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The Contractor shall provide additional sensors if required to properly and completely cover the respective room.
- B. It is the Contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the Owner's facility, to verify placement of sensors and installation criteria.
- C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The Contractor shall also provide, at the Owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.2 FACTORY COMMISSIONING

- A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.
- B. The electrical contractor shall provide both the manufacturer and the Electrical Engineer with ten (10) working days written notice of the scheduled commissioning date. Upon completion of the system fine tuning the factory authorized technician shall provide training to the Owner's personnel in the adjustment and maintenance of the sensors.

END OF SECTION

SECTION 16535

EMERGENCY LIGHTING SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools, coordination and services necessary for and incidental to the installation of an Emergency Lighting System consisting of equipment, components, devices and circuits intended to supply, distribute and control electricity for illumination at code required areas upon failure or interruption of the normal electrical supply or lighting system as shown on the Drawings and as specified herein.
- B. Provide U.L. listed and labeled Emergency Lighting System components, as scheduled and where shown on the drawings, consisting of the following:
 - 1. EXIT SIGNS: Self-powered directional signs reading EXIT complete with arrows, as required, indicating the direction of travel.
 - 2. EMERGENCY LIGHT FIXTURES: Self-contained, surface and/or flush mounted, light fixtures complete with Tungston Halogen lamps, battery and transfer device.
 - 3. INVERTERS: Independent self-contained power pack inverters, complete with battery and transfer devices, for operation of fluourescent lamps in the designated light fixtures.
 - 4. BATTERY PACKS: Storage battery emergency power units complete with attached and/or remote mounted lamp heads.
- C. Provide signal capability for monitoring the system by connection to the security system as required.
- D. Provide, complete, a raceway system of interconnecting conduit, conductors, outlet boxes, pull boxes, switches, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials, related accessories and appurtenances to form a network to serve the components of the system.

PART 2 PRODUCTS

2.1 BASIC EQUIPMENT AND MATERIALS

- A. EXIT SIGNS: Furnish and install self-powered directional signs illuminated by LED lamps that shall provide uniform sign illumination and will continue to operate from battery power during emergency conditions.
 - 1. The unit housing shall be injection molded from high impact, mar-resistant poly carbonate with concealed knockouts for universal mounting, (surface, back or pendant mounting), and an aperture at the bottom for downlighting. Plastic face panel shall contain letters reading EXIT made with 3/4" stroke, and arrows as required, shall be provided indicating the direction of travel. The height and color of the letters and the arrows shall be as required by the governing codes.
 - 2. The unit shall contain extended life LED lamps for normal illumination and for emergency illumination.
 - 3. The unit shall contain a properly sized, 6 volt sealed, on-refillable, maintenance free lead battery that will provide emergency illumination of the sign for a minimum of 90 minutes.
 - 4. The unit shall contain a heavy duty transfer relay to automatically and instantaneously connect lamp load to the battery upon failure of the normal power supply and disconnect the lamps when normal power is restored. A low voltage disconnect shall prevent overdischarge of the battery.
 - 5. The unit shall contain an automatic solid state SCR charger capable of recharging the battery to rated capacity. The unit shall be equipped with a charge monitor and momentary test switch.
 - 6. The unit shall be covered by a full one (1) year manufacturers warranty and a pro-rata

- extended five (5) year warranty.
- B. EMERGENCY LIGHT FIXTURES: Furnish and install 6 volt self-contained, self-powered emergency lighting fixtures. Units shall be designed for recessed or surface installation as scheduled.
1. The unit housing shall be injection-molded flame retardant, impact resistant thermoplastic. Processing frame shall be manufactured of heavy gauge steel, factory painted white.
 2. The unit light source shall be a high-efficiency tungsten halogen lamp producing light at 3200 degrees K. Provide with Alzak reflector and prismatic acrylic lens. The unit shall provide even light distribution with a beam spread of more than 170 degrees free of highlights and hot spots.
 3. The unit shall contain a properly sized, 6 volt sealed, non-refillable, maintenance-free lead battery that will provide emergency illumination for a minimum of 90 minutes.
 4. The unit shall contain a heavy duty transfer relay to automatically and instantaneously connect the lamp load to the battery upon failure of the AC supply, and disconnect the lamps when normal power is restored. A low voltage disconnect shall prevent overdischarge of the battery.
 5. The unit shall contain an automatic solid state SCR charger capable of recharging the battery to rated capacity. The unit shall be equipped with a charge monitor and momentary test switch.
 6. The unit shall be covered by a full one (1) year manufacturers warranty.
- C. INVERTERS: Furnish and install independent self-contained power pack inverters for emergency operation of fluorescent lamps in the designated light fixtures.
1. The unit shall consist of a single housing containing the battery, battery charger, transfer equipment, high frequency inverter ballast, a pilot light and test switch.
 2. The unit shall contain a properly sized high temperature nickel cadmium battery which does not require maintenance and is field replaceable. The battery shall provide emergency illumination of the designated lamps for a minimum of 90 minutes.
 3. The unit shall contain a heavy duty transfer relay to automatically and instantaneously connect lamp load to the battery upon failure of the normal power supply and disconnect the lamps when normal power is restored. Provide a solid state line-latched low voltage disconnect the lamp from the battery when the voltages drops to 70 percent of normal.
 4. The unit shall be circuited and installed such that normal work hour "on-off" switching functions will not cause the lamps to transfer to the emergency mode of operation.
 5. The unit shall be covered by a full two (2) year manufacturers warranty and shall be covered by an additional pro-data extended warranty for the third year.
- D. BATTERY PACKS: Furnish and install 6 volt emergency power units to provide emergency power for illumination upon failure or interruption of the normal lighting system.
1. The unit housing shall contain the battery and all components and shall be a compact case constructed of precision molded high impact thermoplastic material. The unit shall be furnished with a matched, independent mounting bracket with mounting slots for securing unit housing to bracket and the bracket to the wall.
 2. The units shall be provided with attached and/or remote mounted PAR-18, high output lamp assemblies shall be precision molded, high impact thermoplastic material, with access to lamps for replacement. Lamp assemblies shall be fully adjustable horizontally or vertically with the additional flexibility of unit top or side mounting revision in the field without rewiring.
 3. The unit shall contain a properly sized 6 volt sealed, non-refillable, maintenance-free lead battery that will provide emergency illumination for a minimum of 90 minutes.
 4. The unit shall contain a heavy duty transfer relay to automatically and instantaneously connect lamp load to the battery upon failure of the normal power supply and disconnect the lamps when normal power is restored. A low voltage disconnect shall prevent overdischarge of the battery.

5. The unit shall contain an automatic solid state SCR charger capable of recharging the battery to rated capacity. The unit shall be equipped with a charge monitor and momentary test switch.
 6. The unit shall be covered by a full one (1) year manufacturers warranty and a pro-data extended five (5) year warranty.
- E. RACEWAYS: Conduit, conductors, outlet boxes, pull boxes, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons, and other required materials for the 120 volt branch circuits and signal capability shall be as specified in Section 16001 of these specifications.

PART 3 EXECUTION

3.1 SYSTEMS INSTALLATION

- A. Install a complete raceway system of interconnecting conduit, conductors, outlet boxes, convenience outlets, pull boxes, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials, related accessories and appurtenances to form a complete and code approved Emergency Lighting System.
- B. Mount exit light fixtures, emergency light fixtures, and battery operated emergency power units in locations shown on the Drawings. Unit shall be leveled, set plumb and square and secured to structure in strict conformance with the manufacturers recommendations.
- C. Install self-contained power pack inverters in the designated light fixtures shown on the drawing in strict conformance with the manufacturers recommendations.
- D. The conduit system shall be installed per Section 16001 of these specifications and such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
- E. Activate units as recommended by the manufacturer.

3.2 FINAL ADJUSTMENTS

- A. Upon the completion of the Work, test all components of the system to insure proper operation and to prove the system.
- B. Adjust Emergency Light Fixtures, with all other lighting off, to prove code required illumination levels and coverage.
- C. Remove and replace components which have failed, with identical units without additional compensation.
- D. Instruct Owner's personnel in the proper operation maintenance of equipment and the periodic testing of the system and individual components.

END OF SECTION

SECTION 16700

COMBINATION SECURITY/FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools, coordination and service necessary for, and incidental to, the installation of an empty raceway conduit system, system terminal cabinet, outlet boxes and coverplates ready for receipt of the combination security/fire alarm system components, conductors, cable and related accessories. Verify, coordinate and incorporate all of the applicable system requirements as a part of the work of this section.
- B. The combination security/fire alarm system components, devices, cable and related accessories will be provided by others.
- C. Provide, complete, 120 volt power for the security system in the form of a dedicated branch circuit terminating in a duplex convenience outlet with coverplate located at the system terminal cabinet.
- D. Provide signal capability for the system in the form of an empty conduit from the telephone system backboard that terminates in a standard telephone system outlet box with coverplate at the system terminal cabinet to receive a dedicated telephone line.
- E. Provide a terminal cabinet where shown on the drawings for the combination security/fire alarm system as a termination point for the empty conduit network.
- F. Provide and leave the empty raceway conduit system with pull tape for future installation of conductors and/or cable. Empty raceway system shall be required at wall installations only and terminated at 6" above ceiling unless a complete interconnecting conduit raceway system is required by code.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Conduit, outlet boxes, pull boxes, conductors, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons and other required materials for the dedicated 120 volt power and the empty raceway system shall be as specified in Section 16001 of these specifications. Furnish and install nameplate for the terminal cabinet. Verify, coordinate and incorporate the security system manufacturers equipment and material requirements into the work of this section prior to installation.
- B. Empty raceway system for dedicated telephone line shall be as specified in Section 16760 of these Specifications.
- C. System terminal cabinet shall be a NEMA 1 enclosure with a hinged locking door as specified in section 16001 of these specifications.
- D. System devices and components such as alarms, detectors, switches, contacts, buzzers, etc., and system cables, and other related accessories will be furnished and installed by others, including final terminations of cables.
- E. Pull tape for empty raceway systems shall be 200 pound test stranded nylon.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install, complete, raceway systems of conduit, outlet boxes, pull boxes, convenience outlets, coverplates, terminal cabinet, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials for the dedicated 120 volt power, signal and empty raceway systems as well as related accessories and appurtenances furnished by others, to form a network ready for receipt and connection of the combination security/fire alarm system components.
- B. The minimum size conduit shall be electrical trade size 3/4" and no more than two (2) outlets shall be combined on the same homerun, and only long radius elbows shall be used.

- C. The raceway system shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
- D. The security system components, devices, cables, etc., including final connections, will be installed by others.
- E. Leave pull tape in all empty raceways with a minimum of 36" length coiled at each end. Also, tag each end of the pull tape identifying the system and the location of the opposite end.

3.2 OTHER SUPPLIERS SYSTEM SHOP DRAWINGS

- A. Obtain a current, complete set of approved system shop drawings containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.

3.3 FINAL ADJUSTMENTS

- A. Upon the completion of the work, provide assistance as required, during the system testing, to prove and insure the integrity of the power, grounding, signal and raceway system.

END OF SECTION

SECTION 16740

POS SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools, coordination and services necessary for, and incidental to, the installation of a POS system. Verify, coordinate and incorporate all of the applicable system requirements as a part of the work of this section.
- B. The POS system components, data communication cable and related accessories will be provided by others for installation under this Division 16.
- C. Provide, complete, a system of 120 volt branch circuit power from a separate, dedicated panelboard "POS" containing both a separate equipment ground bar and a separate isolating ground bar.
- D. Provide a copper isolated grounding conductor, separate and apart from the panelboard feeder equipment grounding conductor, connected at the building main electrical service ground and installed continuous to the isolated grounding bar in panelboard "POS". Install a separate isolated grounding conductor in each POS branch circuit.
- E. All POS branch circuits shall be dedicated and shall NOT be grouped with a common neutral. Verify the minimum size branch circuit conductor size, from panel POS, shall be made up of solid copper conductors terminating in an isolating grounding receptacle with matching coverplate and shall be comprised of a separate conductor for each of the following:
 - Line
 - Neutral
 - Equipment ground
 - Isolated ground
- F. Each isolated grounding conductor shall be a single, insulated, solid copper conductor.
- G. A second grounding conductor, the equipment ground, shall be used for grounding the conduit and outlet boxes. The isolated grounding conductor shall NOT be used for this purpose.
- H. The conduit containing the 120 volt branch circuit conductors for the POS system shall not be shared with any other conductors, cables, etc., of any description.
- I. Provide signal capability for the POS system in the form of an empty conduit from the telephone system backboard that terminates, in a standard telephone system outlet box to receive a dedicated telephone line. Provide coverplates engraved with the letters "POS".
- J. Provide an empty raceway system of conduit and properly sized junction boxes, with engraved coverplates, for the POS data communication system cable. Coverplates shall be engraved with the letters "POS". The empty raceway system shall be required of wall installations only and terminated at 6" above ceiling unless a complete interconnecting conduit system is required by code.
- K. Provide a flush mounted, double gang outlet box with screw cover for the POS system as a termination point for the empty conduit network.
- L. Provide and leave the empty raceway system with nylon pull tape for future installation of conductors and/or cable.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Panelboard shall contain a separate equipment ground bar and a separate isolated ground bar and shall be as specified in section 16400 of these specifications.
- B. Conduit, conductors, outlet boxes, pull boxes, hangers, supports, sleeves, escutcheons and other required materials for the branch circuit 120 volt power and the empty raceway systems shall be as specified in Section 16001 of these specifications. Verify, coordinate and incorporate POS system manufacturers equipment and material requirements into this work of this section prior to installation.

- C. Isolating ground receptacle shall be 15 amp, 125 volt rated isolated grounding receptacle, orange, of NEMA 5-15R configuration with engraved coverplate for all POS system components. Coverplate shall be engraved at the top with the letters "POS".
- D. Empty raceway system for the dedicated telephone line shall be as specified in Section 16760 of these Specifications.
- E. System terminal enclosure shall be a double-gang outlet box with screw cover, flush mounted where shown on the drawings, and engraved with "POS SYSTEM TERMINAL ENCLOSURE."
- F. System components such as terminals, printers, registers modems, data communication cable, etc., and other related accessories will be furnished by others.
- G. Pull tape for empty raceway systems shall be 200 pound test stranded nylon.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install an empty raceway system of conduit, conductors, cables, outlet boxes, pull boxes, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons, pull tapes, related accessories and appurtenances and other required materials to serve the signal systems, the data communication systems, the 120 volt dedicated branch circuit power, to form a network ready for receipt and connection of the POS system components.
- B. The minimum size conduit shall be electrical trade size as shown on the drawings and only long radius elbows shall be used.
- C. The conduit systems shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
- D. The POS system terminals, printers, registers, modems, components, devices and other related accessories, etc., including final connections, will be installed by others.
- E. The data communication cables will be furnished by others and shall be installed as noted on the drawings.

3.2 SUPPLIERS SYSTEM INSTALLATION MANUALS

- A. Obtain a current, complete set of approved system installation manuals containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.

3.3 FINAL ADJUSTMENTS

- A. Upon the completion of the work, provide assistance as required, during the system testing, to insure the integrity of the power, grounding the raceway system.

END OF SECTION

SECTION 16760

TELEPHONE SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, cables, equipment, tools coordination and services necessary for, and incidental to, the installation of conduit, backboard, cables, outlet boxes and coverplates ready for receipt of the telephone system components, and related accessories.
- B. Verify, coordinate and incorporate all of the applicable requirements of the serving telephone company into the work of this section.
- C. Minimum telephone service consists of the following:

Listed Main Phone #	WAN Line
Phone Line #2	Modem Line
Phone Line #3	FAX Line
Manager Line	Fire Line
Security Line	
- D. The telephone system components and related accessories will be provided by others. Electrical contractor will provide and install cable as shown on drawing diagram.
- E. Provide an underground, conduit, of the type and size required by the serving telephone company, from the serving telephone company point of service connection to the termination point inside this facility at the system backboard.
- F. Provide, complete, 120 volt power for the telephone system in the form of a dedicated branch circuit terminating in a duplex convenience outlet with coverplate located at the telephone system backboard.
- G. Provide a system backboard for the telephone system for the mounting of the system terminals, 120 volt power, system transformer, other related accessories and as a termination point for the conduit network.
- H. Provide a separate grounding conductor between the main electrical service ground and the telephone system backboard.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Conduit, conductors, 24 gauge, 4 pair, level 3 twisted plenum cable, outlet boxes, pull boxes, convenience and outlets, coverplates, hangers, supports, sleeves, escutcheons and other required materials shall be as specified in Section 16001 of these specifications.
- B. System backboard shall be 3/4" thick plywood of the size and type required by the serving telephone company, sealed and painted grey and mounted where shown on the drawings.
- C. System devices such as terminals, switches, contacts, etc., and other related accessories will be furnished and installed by others, including final terminations of devices and cables.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install, complete, raceway systems of interconnecting conduit and cables, outlet boxes, pull boxes, convenience outlets, coverplates, terminal cabinet, or system backboard, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials for the dedicated 120 volt power and raceway system as well as related accessories and appurtenances furnished by others, to form a network ready for receipt and connection of the telephone system components.
- B. The minimum size conduit shall be electrical trade size 3/4" and each outlet shall be run in wall only and terminated at 6" above ceiling unless a complete interconnecting raceway system of conduit is required by code.

- C. The raceway systems shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
 - D. The telephone system components, devices, etc., including final connections, will be installed by others.
 - E. A minimum of 36" of cable shall be coiled at each outlet and a minimum of 10' of cable shall be coiled at telephone backboard. Leave pull tape in all empty raceway systems with minimum of 36" length at each end. Also, tag each end of the pull tape identifying the system and the location of the opposite end.
- 3.2 TELEPHONE COMPANY STANDARDS
- A. Obtain a current, complete set of approved telephone company standards containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.
- 3.3 FINAL ADJUSTMENTS
- A. Upon the completion of the work, provide assistance as required, during the system testing, to prove and insure the integrity of the power, grounding and raceway system.

END OF SECTION

SECTION 16770
SOUND SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools, coordination and services necessary for, and incidental to, the installation of a complete empty raceway system of interconnecting conduit, outlet boxes and coverplates ready for receipt of the sound system components, conductors, cable and related accessories. Verify, coordinate and incorporate all of the applicable system requirements as a part of the work of this section.
- B. The sound system components, Audio/Video Rack, cable and related accessories will be provided by others.
- C. Provide, complete 120 volt power for the sound system in the form of a dedicated branch circuit terminating in a quadplex convenience outlet with single coverplate located at the sound system terminal enclosure.
- D. Provide a terminal enclosure, where shown on the drawings, for the sound system as a termination point for the empty conduit network.
- E. Provide and leave the empty raceway systems with pull tape for future installation of conductors and/or cable.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Conduit, outlet boxes, pull boxes, conductors, convenience outlets, coverplates, hangers, supports, sleeves, escutcheons and other required materials for the dedicated 120 volt power and the empty raceway system shall be as specified in Section 16001 of these specifications. All system coverplates, covers, etc., shall be engraved with the letters "SOUND SYSTEM". Verify, coordinate and incorporate the sound system manufacturers equipment and material requirements into the work of this section prior to installation.
- B. System terminal enclosure shall be a double-gang outlet box with screw cover, mounted where shown on the drawings.
- C. System components and devices such as consoles, speakers, volume controls, microphone, etc., and system cables, and other related accessories will be furnished and installed by others, including final terminations of cables.
- D. Pull tape for empty raceway systems shall be 200 pound test stranded nylon.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install, complete, raceway system of interconnecting conduit, conductors, outlet boxes, pull boxes, convenience outlets, coverplates, terminal enclosure, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials, for the dedicated 120 volt power and empty raceway systems as well as related accessories and appurtenances furnished by others, to form a network ready for receipt and connection of the sound system components.
- B. The minimum size conduit shall be electrical trade size 1/2" and only long radius elbows shall be used.
- C. The raceway systems shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
- D. The sound system components, devices, cables, etc., including final connections, will be installed by others.
- E. Leave tape in all empty raceways with a minimum of 36" length coiled at each end. Also, tag each end of the pull tape identifying the system and the location of the opposite end.

3.2 SUPPLIERS SYSTEM INSTALLATION MANUALS

- A. Obtain a current, complete set of approved system installation manuals containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.

3.3 FINAL ADJUSTMENTS

- A. Upon the completion of the work, provide assistance as required, during the system testing, to insure the integrity of the power, grounding and raceway system.

END OF SECTION

SECTION 16780

ANTENNA SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, material, equipment, tools, coordination and services necessary for, and incidental to, the installation of a complete empty raceway system of interconnecting conduit, outlet boxes and coverplates ready for receipt of the antenna system components, conductors, cable and related accessories. Verify, coordinate and incorporate all of the applicable system requirements as a part of the work of this section.
- B. The antenna system components, cable and related accessories will be provided by others.
- C. 120 volt power provided & located in the Audio/Video Cabinet by others.
- D. Provide a system terminal where shown on the drawings, for the antenna system as a termination point for the empty conduit network.
- E. Provide and leave the empty raceway systems with pull tape for future installation of conductors and/or cable.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

- A. Conduit, outlet boxes, pull boxes, conductors, convenience outlet, coverplates, hangers, supports, sleeves, escutcheons and other required materials for the dedicated 120 volt power and the empty raceway system shall be as specified in Section 16001 of these specifications. All system coverplates, covers, etc., shall be engraved with the letters "ANTENNA SYSTEM". Verify, coordinate and incorporate the antenna system manufacturers equipment and material requirements into the work of this section prior to installation.
- B. System terminal shall be included in the Audio/Video Rack by others.
- C. System components and devices such as consoles, controls, etc., and system cables, and other related accessories will be furnished and installed by others, including final terminations of cables.
- D. Pull tape for empty raceway systems shall be 200 pound test stranded nylon.

PART 3 EXECUTION

3.1 INSTALLATION OF MATERIALS

- A. Install, complete, raceway system of interconnecting conduit, conductors, outlet boxes, pull boxes, convenience outlets, coverplates, terminal enclosure, hangers, supports, sleeves, escutcheons, pull tapes, and other required materials, for the dedicated 120 volt power and empty raceway systems as well as related accessories and appurtenances furnished by others, to form a network ready for receipt and connection of the T.V. antenna system components.
- B. The minimum size conduit shall be electrical trade size 3/4" and only long radius elbows shall be used.
- C. The raceway systems shall be installed such that no conduit run shall exceed 80' feet between pull-boxes or outlet boxes, or contain the equivalent of more than two (2) ninety degree elbows between pull-boxes or outlet boxes.
- D. The antenna system components, devices, cables, etc., including final connections, will be installed by others.
- E. Leave pull tape in all empty raceways with a minimum of 36" length coiled at each end. Also, tag each end of the pull tape identifying the system and the location of the opposite end.

3.2 SUPPLIERS SYSTEM INSTALLATION MANUALS

- A. Obtain a current, complete set of approved system installation manuals containing complete installation requirements and instructions for the equipment, components, material and products selected for this project. Incorporate the applicable requirements into the Work of this section and into the shop drawings specified in Section 16000 prior to the commencement of installation.

3.3 FINAL ADJUSTMENTS

- A. Upon the completion of the work, provide assistance as required, during the system testing, to insure the integrity of the power, grounding and raceway system.

END OF SECTION

