

**PROJECT MANUAL
& SPECIFICATIONS**

Western Heights Phase 1

1800 Vermont Avenue, Knoxville, TN 37921

for:

KCDC and Brinshore Development

June 30, 2023

HUD / FHA Project Number (TBD)

Smith Gee Studio, LLC

Architect

Print Name

Signature

Date

Owner

Print Name

Signature

Date

General Contractor

Print Name

Signature

Date

Bonding Company

Print Name

Signature

Date

Lender

Print Name

Signature

Date

ARCHITECT:



Smith Gee Studio, LLC
602 Taylor Street, Suite 201, Nashville, Tennessee 37208

SECTION 000107 – PROFESSIONAL SEALS

PART 1 - GENERAL

1.1 DESIGN PROFESSIONALS OF RECORD

A. ARCHITECT

1. Smith Gee Studio, LLC
602 Taylor Street, Suite 201
Nashville, Tennessee 37208
(615) 645-5522
Hunter Gee, AIA
hgee@smithgeestudio.com

B. STRUCTURAL ENGINEER

1. Haines Structural Group
800 S. Gay Street, Suite 1750
Knoxville, Tennessee 37929
(865) 329-9920
__Name__, P.E.
email@haines-sg.com

C. MECHANICAL, PLUMBING, AND FIRE SPRINKLER PROTECTION ENGINEER

1. Facility Systems Consultants, LLC
713 South Central Street, Suite 101
Knoxville, Tennessee 37902
(865) 246-0164
__Name__, P.E.
email@facilitysystems.org

D. ELECTRICAL AND FIRE ALARM ENGINEER

1. Facility Systems Consultants, LLC
713 South Central Street, Suite 101
Knoxville, Tennessee 37902
(865) 246-0164
__Name__, P.E.
email@facilitysystems.org

1.2 DESIGN PROFESSIONALS UNDER OWNER

A. CIVIL ENGINEER

1. Civil & Environmental Consultants, Inc.
2704 Cherokee Farm Way, Suite 101
Knoxville, Tennessee 37920
(865) 977-9997
__Name__, P.E.
email@cecinc.com

B. LANDSCAPE ARCHITECT

1. Hodgson Douglas, LLC
507 Main Street
Nashville, Tennessee 37206
(615) 327-4447
Richard Jones, RLA
rjones@hodgsondouglas.com

END OF SECTION 000107

WESTERN HEIGHTS PHASE I

Smith Gee Studio Project Number 23002.00
HUD/FHA Project Number (T.B.D.)

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(Not Applicable.)

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- 26 05 53 - Electrical Identification
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- 26 24 00 - Mechanical Equipment and Controls
- 26 27 26 - Wiring Devices and Plates
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(Coordinate with Owner’s Consultants directly.)

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(Coordinate with Owner’s Consultants directly.)

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(Not Applicable.)

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(Not Applicable.)

SECTION 003119 – EXISTING CONDITION INFORMATION AVAILABLE

PART 1 - GENERAL

1.1 SITE SURVEY

- A. The Owner has contracted with Civil & Environmental Consultants, Inc. for a boundary and topographic survey of the existing site (CEC Project No. 328-443). A copy of the survey drawing, dated March 30, 2023, is included with the drawings.

END OF SECTION 003119

SECTION 003132 – GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL REPORT

- A. The Owner has contracted with GEOServices, LLC for the geotechnical exploration of the existing site (GEOS report number 21-23276). A copy of this report, dated March 28, 2023, is included here.

END OF SECTION 003132

March 28, 2023

Knoxville's Community & Development Corporation
Redevelopment Department
901 North Broadway Street
Knoxville, Tennessee

ATTENTION: Mr. James Hatfield
jhatfield@kcdc.org

Subject: **REPORT OF GEOTECHNICAL EXPLORATION**
Vermont Avenue Multi-Family Development
1800 & 1900 Vermont Avenue
Knoxville, Tennessee
GEOservices Project No. 21-23276

Dear Mr. Hatfield:

We are submitting the results of the geotechnical exploration performed for the subject project. The geotechnical exploration was performed, in accordance with our Proposal No. 11-23173, dated February 1, 2023, and as authorized by you. The following report presents our findings and recommendations for the proposed project. Should you have any questions regarding this report, or if we can be of any further assistance, please contact us at your convenience.

Sincerely,

GEOservices, LLC



Michael D. Kelso, P.E.
Geotechnical Project Manager
TN 122,250

A handwritten signature in black ink that reads "Ibrahim Aklouk".

Ibrahim M. Aklouk, E.I.
Geotechnical Staff Professional

SECTION 004343 – PREVAILING WAGE RATES

PART 1 - GENERAL

1.1 HUD STANDARDS

- A. The Federal Labor Standards Provisions required by the U.S. Department of Housing and Urban Development Office of Davis-Bacon and Labor Standards shall apply to this project.

END OF SECTION 004343

"General Decision Number: TN20230182 05/12/2023

Superseded General Decision Number: TN20220182

State: Tennessee

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Knox County in Tennessee.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<p>. Executive Order 14026 generally applies to the contract.</p> <p>. The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.</p>
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<p>. Executive Order 13658 generally applies to the contract.</p> <p>. The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.</p>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	04/21/2023
2	05/12/2023

* ASBE0086-002 03/01/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 35.27	17.72

ELEC0270-002 06/01/2021

	Rates	Fringes
ELECTRICIAN (Low Voltage Wiring Only).....	\$ 32.96	11%+8.10

ELEC0760-001 06/01/2022

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring).....	\$ 27.25	13.98

ENGI0917-004 05/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Crane).....	\$ 28.26	10.10

IRON0492-001 05/01/2022

	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	\$ 31.15	15.66
IRONWORKER, REINFORCING.....	\$ 31.15	15.66

LABO0818-005 05/01/2021

	Rates	Fringes
LABORER (Pipelayer).....	\$ 21.45	8.06

* PLUM0102-001 05/01/2023

	Rates	Fringes
PIPEFITTER.....	\$ 33.51	15.70

* SHEE0005-002 05/01/2022

	Rates	Fringes
SHEET METAL WORKER (SIDING (METAL/ALUMINUM/VINYL)).....	\$ 33.33	12.84

* SHEE0005-003 05/01/2022

	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only).....	\$ 33.33	12.84

TEAM0519-001 05/01/2021

	Rates	Fringes
TRUCK DRIVER (Dump Truck).....	\$ 24.81	8.10

* UAVG-TN-0001 01/01/2023

	Rates	Fringes
SHEET METAL WORKER (HVAC Unit Installation Only).....	\$ 33.34	13.09

* SUTN2017-035 04/16/2021

	Rates	Fringes
BRICKLAYER.....	\$ 20.00	0.00
CARPENTER.....	\$ 20.09	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 22.67	4.11
IRONWORKER, STRUCTURAL.....	\$ 18.30	0.00
LABORER DEMOLITION.....	\$ 16.74	0.00
LABORER GRADE CHECKER.....	\$ 13.01 **	0.00
LABORER: Common or General.....	\$ 12.73 **	1.77
LABORER: Mason Tender - Brick...	\$ 13.54 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 13.00 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 27.77	9.75
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 16.84	0.00
OPERATOR: Bulldozer.....	\$ 28.52	9.75
OPERATOR: Drill.....	\$ 26.50	4.76
OPERATOR: Forklift.....	\$ 15.00 **	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 14.70 **	0.00
OPERATOR: Roller.....	\$ 14.35 **	0.00
PAINTER (Brush and Roller).....	\$ 19.31	10.15
PLUMBER.....	\$ 21.63	7.16
ROOFER.....	\$ 16.29	0.00
SHEET METAL WORKER, Excludes HVAC Duct and Unit Installation.....	\$ 24.19	7.52
TILE FINISHER.....	\$ 14.00 **	0.00

TILE SETTER.....	\$ 19.65	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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 ** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

 The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1,

2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

SECTION 005213 – FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

PART 1 - GENERAL

1.1 SUMMARY

- A. The U.S. Department of Housing and Urban Development form “HUD-92442M – Construction Contract”, as modified by the Owner, will be the form of Agreement, as included herein.

END OF SECTION 005213

CONSTRUCTION CONTRACT

**U.S. Department of Housing and
Urban Development**
Office of Housing

OMB Approval No. 2502-0598
(Exp. 9/30/2021)

Public Reporting Burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Response to this request for information is required in order to receive the benefits to be derived. This agency may not collect this information, and you are not required to complete this form unless it displays a currently valid OMB control number. While no assurance of confidentiality is pledged to respondents, HUD generally discloses this data only in response to a Freedom of Information Act request.

Warning: Federal law provides that anyone who knowingly or willfully submits (or causes to submit) a document containing any false, fictitious, misleading, or fraudulent statement/certification or entry may be criminally prosecuted and may incur civil administrative liability. Penalties upon conviction can include a fine and imprisonment, as provided pursuant to applicable law, which includes, but is not limited to, 18 U.S.C. 1001, 1010, 1012; 31 U.S.C. 3729, 3802, 24 C.F.R. Parts 25, 28 and 30, and 2 C.F.R. Parts 180 and 2424.

HUD Project No.: _____
Project Name: _____

Cost Plus Contract _____
Lump Sum Contract _____

THIS CONSTRUCTION CONTRACT (“Contract”) is made this _____ day of _____, 20____, between _____ (“**Contractor**”) and _____ (“**Owner**”) (“**Parties**”).

The definition of any capitalized term or word used herein can be found in this Contract and the General Conditions, except the term “**Project**” shall have the same definition as in the Regulatory Agreement between Borrower (Owner) and HUD, except that the term “**Program Obligations**” means (1) all applicable statutes and any regulations issued by the Secretary pursuant thereto that apply to the Project, including all amendments to such statutes and regulations, as they become effective, except that changes subject to notice and comment rulemaking shall become effective only upon completion of the rulemaking process, and (2) all current requirements in HUD handbooks and guides, notices, and mortgagee letters that apply to the Project, and all future updates, changes and amendments thereto, as they become effective, except that changes subject to notice and comment rulemaking shall become effective only upon completion of the rulemaking process, and provided that such future updates, changes and amendments shall be applicable to the Project only to the extent that they interpret, clarify and implement terms in this Contract rather than add or delete provisions from such document. Handbooks, guides, notices, and mortgagee letters are available on “HUDCLIPS,” at www.hud.gov. Any HUD form referenced herein shall be the current version of that form, and shall include any successor form adopted by HUD.

The Contractor and the Owner agree as follows:

Article 1: Scope of Contract

A. The Contract between the Parties is set forth in the “**Contract Documents**,” which consist of this Contract and the other documents identified in Article 2 below. Together, these form the entire Contract between Owner and Contractor, and by this reference these Contract Documents are fully incorporated herein. Any previously

existing contract or understanding concerning the Work contemplated by the Contract Documents is hereby revoked. Any side agreements between Owner and Contractor shall be disclosed to HUD.

B. Except to the extent specifically indicated in the Contract Documents to be the responsibility of others, Contractor shall furnish all of the materials and perform all of the Work shown on, and in accordance with, the Drawings and Specifications.

C. The Contract shall not be amended without the prior written approval of Lender and HUD in accordance with Program Obligations. Failure to receive such prior HUD and Lender approval shall render any such amendment void.

Article 2: Identification of Contract Documents

A. The Contract Documents are identified as follows:

(1) This Construction Contract (HUD-92442M) (“Contract”).

(2) The General Conditions of the Contract for Construction, AIA Document A201 – _____ {Insert year of current edition} (“General Conditions”, attached hereto as Exhibit ___), expressly excepting those provisions mandating binding arbitration. If any of the provisions of this Contract conflict with the terms contained in the General Conditions, the provisions in this Contract shall control.

(3) The Supplementary Conditions to the Construction Contract (HUD-92554M), attached hereto as Exhibit ___.

(4) The Drawings, an index of which is attached hereto as Exhibit___.

Number_____Title_____Pages_____

(5) The Specifications, an index of which is attached hereto as Exhibit___

Number_____Title_____Pages_____

(6) The Contractor's and/or Mortgagor's Cost Breakdown (HUD-2328), approved by HUD on the date of _____, 20____, attached hereto as Exhibit___.

(7) **[Applicable for Cost Plus Contracts when an Incentive Payment Addendum is agreed to by the Parties]** If this is designated a Cost Plus Contract, the Construction Contract Incentive Payment (HUD-

92443) form is attached hereto as Exhibit___ (Incentive Payment Addendum).

OR

[Applicable for Lump Sum Contracts when an Incentive Payment Addendum is agreed to by the Parties] If this is designated a Lump Sum Contract and there is no Identity of Interest between Contractor and Owner, the Construction Contract Incentive Payment (HUD-92443) form is attached hereto as Exhibit___ (Incentive Payment Addendum).

(8) The Prevailing Wage Determination _____ Modification Number_____, last published/modified on (date) _____, 20____, and attached hereto as Exhibit_____.

(9) Completed and fully-executed document identifying Identities of Interest among Owner, Contractor, Subcontractors, and Architect (see Appendix 8 of Handbook 4430.1 and the MAP Guide Appendices), attached hereto as Exhibit _____.

(10) Any change orders approved by HUD after the execution of this Contract.

(11) If applicable, the Retainage Reduction Rider attached hereto as Exhibit_____.

B. The Drawings and Specifications were prepared by _____ (“**Design Architect**”). The architect administering the Construction Contract is _____ (“**Architect**”).

C. A master set of the Drawings and Specifications, identified by the signatures of Owner, Contractor, Design Architect, Architect, Lender , and Contractor’s surety or guarantor (if applicable), have been placed on file with HUD, and shall govern in all matters that arise with respect to the Contract Documents.

D. Changes in the Drawings and Specifications, or any terms of the Contract Documents, including orders for extra work, changes by altering or adding to the Work, orders that shall change the design concept, or orders extending the Project Substantial Completion Deadline (identified in Article 3) may be effected only with the prior written approval of Owner’s Lender (as defined in Article 11) and HUD, and under such conditions as either Lender or HUD may establish.

Article 3: Time

A. Contractor shall commence the Work to be performed under this Contract within fourteen (14) days of this Contract and shall bring the Work to Project Substantial Completion by _____, 20____ [this date shall be dependent on when the Work

is commenced] (“**Project Substantial Completion Deadline**”).

B. “**Project Substantial Completion**” shall be the date that the HUD Representative signs the final FHA Inspection Report contained in form HUD-92485 (Permission to Occupy Project Mortgages) for the Project required by the Contract Documents and Program Obligations, provided the Permission to Occupy in the same HUD-92485 is subsequently signed by the Authorized Agent of FHA. For purposes of determining any Liquidated Damages in Article 3.E below, “**Substantial Completion**” shall be the stage in the progress of the Work when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents and Program Obligations so that the Owner can occupy or utilize that designated portion of the Work for its intended use, the HUD Representative signs the FHA Inspection Report in form HUD-92485, and the Permission to Occupy in the same HUD-92485 is subsequently signed by the Authorized Agent of FHA. Notwithstanding any other provision in the Contract Documents, Contractor remains liable to complete items of incomplete construction as approved in HUD’s sole discretion.

C. The Project Substantial Completion Deadline may be extended in accordance with the terms of the General Conditions only with the prior written approval of HUD through a HUD-approved change order.

D. Contractor shall correct any defects due to faulty materials or workmanship which appear within twelve (12) months from Project Substantial Completion. Warranty for Work first performed after Project Substantial Completion or portions of the Work not specifically included in a Certificate of Substantial Completion (defined as any executed Permission to Occupy in HUD-92485) shall extend twelve (12) months from the Date of Final Completion. The “**Date of Final Completion**” shall be the date the HUD representative signs the final HUD Representative’s Trip Report (form HUD-95379) provided that the trip report is subsequently endorsed by the Construction Manager. Warranty for all Work performed after the Date of Final Completion shall extend twelve (12) months from the date all such Work is completed.

E. If Contractor does not meet the Project Substantial Completion Deadline or such date to which the Project Substantial Completion Deadline may be mutually extended by approved change order, in accordance with the Drawings and Specifications, including any authorized changes, the maximum sum stated in Article 4 (either Option 1 or Option 2) below shall be reduced by \$_____ per unit for each day of delay until Project Substantial Completion (“**Liquidated Damages**”). Liquidated Damages, however, shall not be assessed against any of the Work that has reached Substantial Completion (if applicable) in accordance with Program Obligations. When Owner submits to HUD its Cost Certification, Actual Damages shall be calculated. The term “**Actual Damages**” is defined as the actual cost of interest, taxes, insurance and mortgage insurance premiums, less the Project’s net operating income, for the period from the Project Substantial Completion Deadline through Project Substantial Completion, the calculation of which shall be approved by HUD. The lesser of the Liquidated Damages or Actual Damages shall be applied.

F. [**Applicable when an Incentive Payment Addendum is agreed to by the Parties**] The Parties have completed the appropriate blank spaces in Article 4 (Option 1 or Option 2) below with respect to “**Incentive Payment**,” providing for the payment of an additional sum to Contractor as an incentive for completing the Project earlier than

the Project Substantial Completion Deadline, or by such date to which the Project Substantial Completion Deadline may be extended by approved change order. If the Work is brought to Project Substantial Completion before the Project Substantial Completion Deadline, the contract sum stated in Article 4 (Option 1 or Option 2) below shall be increased, as indicated, by an Incentive Payment calculated in accordance with the Incentive Payment Addendum, consistent with Program Obligations. In cases requiring cost certification by Contractor, Contractor shall not be entitled to any Incentive Payment resulting from early completion if HUD determines that Contractor's cost certification is fraudulent or materially misrepresents Contractor's Actual Cost of Construction, as defined herein.

[Option 1] Article 4: Contract Sum -- Cost Plus Contract

A. Subject to the provisions hereinafter set out, Owner shall pay to Contractor for the performance of this Contract the following items in cash:

- (1) The Actual Cost of Construction as defined in Article 13 below; plus
- (2) Builder's Profit of \$ _____.

In no event, however, shall the total cash payable pursuant to this paragraph A exceed \$ _____.

B. In addition to any cash fee provided for in paragraph A, Owner shall pay to Contractor, by means other than cash, the following:

- (1) A promissory note in the form prescribed by HUD in the amount of \$ _____.
- (2) \$ _____ in the form of _____.

C. If Contractor shall have received cash payments in excess of (a) the Actual Cost of Construction plus (b) the Builder's Profit, plus any additional amount to be paid under the provisions of paragraph B, all such excess shall be refunded to Owner.

D. **[Applicable when an Incentive Payment Addendum is agreed to by the Parties]** Incentive Payment, where there is no Identity of Interest between Owner and Contractor:

- (1) If the Work is completed prior to the Project Substantial Completion Deadline, Owner shall make an incentive payment to Contractor. The amount of the payment shall be determined according to Exhibit ____, attached hereto, and consisting of page 2 of HUD-92443, entitled Incentive Payment Computation. Steps 1(a) and 3(b) thereof contain blanks that are to be filled in at the time this Contract is executed. *(Insert that portion of the sum of interest, taxes, insurance, and Mortgage Insurance Premium that appears in Section G of HUD-92264 attributable to the construction period. If there has been a change in the interest rate charged for the construction period (see footnote designated "***" on page 1 of HUD-92443), the dollar amount included in Section G of HUD-92264 must be adjusted. The adjusted amount must be reflected in the savings computation.)* Furthermore, the procedures set forth in footnote designated "***" on page 1 of HUD-92443 must be followed.

(2) If Contractor shall have received cash payments in excess of (a) the Actual Cost of Construction plus (b) the Builder's Profit, plus any additional amount to be paid under the provisions of paragraph B, plus the incentive payment under the provisions of paragraph D(1) above, all such excess shall be refunded to Owner.

(3) No incentive payment shall be allowed on savings in costs disallowed by HUD or if Contractor's cost certification is found by HUD to be either fraudulent or to materially misrepresent the Actual Cost of Construction.

E. [Applicable when an Incentive Payment Addendum is agreed to by the Parties] Incentive Payment, where there is an Identity of Interest between Owner and Contractor:

(1) The cash upset figure set forth at the end of paragraph A, immediately above is hereby increased by the amount by which \$_____ (the estimated sum of interest on the Loan, taxes, and property insurance and mortgage insurance premiums applicable to the construction period for this Project (See footnote designated "***" on page 1 of HUD-92443)) exceeds the Borrower's certified actual cost for these items through Project Substantial Completion, as approved by HUD, provided that construction is completed prior to the Project Substantial Completion Deadline, as amended by approved change order, and, further, that in no event shall the total cash payable exceed the Actual Cost of Construction as approved by HUD.

(2) If the aggregate interest rate during the construction period is determined at the time of cost certification to be less than that upon which the Note was endorsed, the estimated amount for interest, line 53 of HUD-92264, shall be adjusted accordingly and the dollar amount set forth in paragraph E(1) shall be reduced.

[Option 2] Article 4: Contract Sum -- Lump Sum Contract

A. Owner shall pay Contractor for the performance of this Contract, hereinafter provided, the sum of \$_____ (_____ and _____/100 dollars).

B. [Applicable when an Incentive Payment Addendum is agreed to by the Parties] Incentive Payment: If the Work is completed prior to the Project Substantial Completion Deadline, Owner shall pay to Contractor, in addition to the contract sum stated in paragraph A, an amount equal to ____% (not to exceed 50%) of the amount by which the sum of Owner's certified cost of interest, real estate taxes, insurance premiums and mortgage insurance premium during construction, as approved by HUD through Project Substantial Completion, is exceeded by HUD's estimates of these same items, which estimate is \$_____. *(Insert that portion of the sum of interest, taxes, insurance, and mortgage insurance premium that appears in Section G of HUD-*

92264 attributable to the construction period. If there has been a change in the interest rate charged for the construction period (See footnote designated “**” on page 1 of HUD-92443), the dollar amount included in Section G of HUD-92264 must be adjusted. The adjusted amount must be reflected in the savings computation.) No incentive payment shall be allowed on savings in costs disallowed by HUD or if Contractor’s cost certification is found by HUD to be either fraudulent or to materially misrepresent the Actual Cost of Construction.

Article 5: Requisition and Payment Procedures

A. Each month after the commencement of Work hereunder, Contractor shall make a monthly request on HUD-92448 for payment by Owner for Work done during the preceding month. Each request for payment shall be filed at least 15 days before the date payment is desired. Subject to the approval of Lender and HUD, Contractor shall be entitled to payment thereon in an amount equal to (1) the total value of classes of the Work acceptably completed; plus (2) the value of materials and equipment not incorporated in the Work, but delivered to and suitably stored at the site; plus (3) the value of components stored off-site in compliance with Program Obligations; less (4) ten (10) percent holdback [as this percentage may be reduced in accordance with the provisions of the Retainage Reduction Rider attached hereto, if applicable](or as reduced by HUD in writing) and less (5) prior payments. The “values” of (1), (2) and (3) shall be computed in accordance with the amounts assigned to classes of Work in HUD-92328.

B. With its final application for payment by Owner, Contractor shall disclose, on a form prescribed by HUD, all unpaid obligations contracted in connection with the Work performed under this Contract. Contractor agrees that within 15 days following receipt of final payment, it shall pay such obligations in cash and furnish satisfactory evidence of such payment to Owner.

C. The balance due to Contractor hereunder shall be payable upon the expiration of thirty (30) days after the Work hereunder is fully completed, provided the following have occurred: (1) all Work hereunder requiring inspection by Governmental Authorities having jurisdiction has been inspected and approved by such authorities and by the rating or inspection organization, bureau, association or office having jurisdiction; (2) all certificates of occupancy, or other approvals, with respect to the Project have been issued by Governmental Authorities; (3) Permission(s) to Occupy (HUD-92485) for all units of the Project have been issued by HUD; (4) where applicable, HUD shall have approved Contractor’s Certificate of Actual Cost; (5) as-built Drawings and Specifications, the as-built survey and all warranties shall have been delivered to Owner; and (6) all executed final advance documents required by HUD have been submitted.

Article 6: Receipts, Releases of Liens & Payments for Materials & Equipment

A. Contractor agrees that within fifteen (15) days following receipt of each monthly payment, it shall pay in full and in cash all obligations for Work done and

materials, equipment and fixtures furnished through the date covered by such monthly payment. Contractor may withhold retainage from the payment due each subcontractor, corresponding to, but not exceeding, the ten (10) percent holdback specified in item (4) of Article 5, paragraph A.

B. Owner may require Contractor to attach to each request for payment its acknowledgment of payment and all subcontractors' and material suppliers' acknowledgments of payment for Work done and materials, equipment and fixtures furnished through the date covered by the previous payment.

C. Contractor agrees that no materials or equipment required by the Specifications shall be purchased under a conditional sale contract or with the use of any security agreement or other vendor's title or lien retention instrument.

D. Concurrently with the final payment, Contractor shall execute a waiver or release of lien for all the Work performed and materials furnished hereunder, and Owner shall require Contractor to obtain similar waivers or releases from all subcontractors and material suppliers, if permitted by state law.

Article 7: Obligations of Contractor

A. Contractor shall furnish, at its own expense (or Owner's expense, if applicable), all building and other permits, licenses, tools, equipment and temporary structures necessary for the construction of the Project. Contractor shall give all required notices and shall comply with all applicable codes, laws, ordinances, rules and regulations, and protective covenants, wherever applicable. Contractor shall comply with the provisions of the Occupational Safety and Health Act of 1970. Contractor shall immediately notify Owner, Lender and HUD of the delivery of all permits, licenses, certificates of inspection, certificates of occupancy, and any other such certificates and instruments required by law, regardless of to whom issued, and shall cause them to be displayed to Owner, Lender and HUD upon request.

B. If Contractor observes that the Drawings and Specifications are at variance with any applicable codes, laws, ordinances, rules or regulations, or protective covenants, it shall promptly notify Architect in writing, and any necessary changes shall be made as provided in this Contract for changes in the Drawings and Specifications. If Contractor performs any Work knowing it to be contrary to such codes, laws, ordinances, rules or regulations, or protective covenants, without giving such notice to Architect, it shall bear all costs arising therefrom.

C. Upon completion of construction, Contractor shall furnish to Owner a land survey map prepared in accordance with Program Obligations, ALTA-NSPS standards and the HUD Surveyor's Report showing the location on the site of all improvements constructed thereon, and showing the location of all water, sewer, gas and electric lines and mains, and of all existing utility easements. Such survey map shall be prepared by a licensed surveyor who shall certify that the Work is installed and erected entirely upon the land covered by the Security Instrument and within any building restriction lines on said land, and does not overhang or otherwise encroach upon any easement or right-of-way of others. To the extent such data shows that the Contractor has deviated from the Plans and Specifications, Contractor shall be responsible, at its own expense (or Owner's expense, if applicable), for correcting any such deviations. In addition,

Contractor shall furnish additional surveys when Owner so requires, for any improvements, including structures and utilities not theretofore located on a survey.

D. Contractor shall assume full responsibility for the maintenance of all landscaping that may be required by the Drawings and Specifications until such time as both Parties to this Contract shall receive written notice from HUD that such landscaping has been finally completed. Owner hereby agrees to make available to the Contractor, for such purpose, without cost to the latter, such facilities as water, hose and sprinkler.

E. There shall be withheld from the final payment an amount satisfactory to Lender and HUD for any Work items that are incomplete at the time of such final payment.

Article 8: Assurance of Completion

Contractor shall furnish to Owner assurance of completion of the Work in the form of (specify) _____
_____. Such assurance of completion shall run to Owner and Lender as obligees and shall contain a provision whereby the surety agrees that any claim or right of action that either Owner or Lender might have thereunder may be assigned to HUD.

Article 9: Waiver of Lien or Claim

A. In jurisdictions where permitted by law, Contractor shall not file a mechanic's or materialman's lien or maintain any claim against Owner's Land or Improvements for or on account of any Work done, labor performed or materials furnished under this Contract, and shall include in each subcontract a clause which shall impose this requirement on the subcontractor.

B. In jurisdictions where permitted by law, Owner may require Contractor to execute a waiver of liens that shall be recorded prior to the commencement of construction. Contractor for itself, subcontractors, suppliers, materialmen, and all persons acting through or under it, agrees not to file or maintain mechanics' liens or claims against the property described herein, on account of Work done, labor performed or materials provided by them.

Article 10: Right of Entry

A. At all times during construction, HUD, Lender, and their agents or assigns shall have the right of entry and free access to the Project and the right to inspect all Work done and materials, equipment and fixtures furnished, installed or stored in and about the Project. For such purpose, Contractor shall furnish such enclosed working space as Lender or HUD may require and find acceptable as to location, size, accommodations and furnishings.

Article 11: Assignments, Subcontracts and Termination

A. This Contract shall not be assigned by either party without the prior written consent of the other party, Lender and HUD, except that Owner may assign this Contract, or any rights hereunder, to Lender or HUD.

B. Contractor shall not subcontract all of the Work to be performed hereunder without the prior written consent of Owner, Lender and HUD.

C. Upon request by Owner, Lender or HUD, Contractor shall disclose the names of all persons with whom it has contracted or will contract with respect to Work to be done and materials and equipment to be furnished hereunder.

D. Contractor understands that the Work under this Contract is to be financed by a building loan to be secured by a Security Instrument and insured by HUD, and that the terms of said Loan are set forth in a Building Loan Agreement between Owner as Borrower and _____ as Lender.

E. Contractor further understands that said Building Loan Agreement provides that, in the event of the failure of Owner to perform its obligations to Lender thereunder, Lender may, as attorney-in-fact for Owner, undertake the completion of the Project in accordance with this Contract. In the event Lender elects not to undertake such completion, this Contract shall terminate pursuant to AIA Document A201 § 14.2 in the case of termination for cause, or AIA Document A201 § 14.4 in the case of termination for convenience.

Article 12: Roles of HUD and Lender

HUD is the insurer of Lender's Loan made to finance the construction identified herein, pursuant to the Building Loan Agreement. Nothing provided herein, no action or inaction of the Parties to this Contract, or actions or inaction by any third parties, shall impute to HUD or Lender status as a party to this Contract; HUD and Lender have no liability to Contractor or Owner under the Contract Documents.

[Option 1] Article 13: Certification of Actual Cost -- Cost Plus Contract

A. The "**Actual Cost of Construction**" shall include all items of cost and expense incurred by Contractor in the performance of this Contract. Allowable items of cost and expense incurred by Contractor in the performance of this Contract shall include costs and expenses of labor, materials for construction, equipment and fixtures, field engineering, sales taxes, workmen's compensation insurance, social security, public liability insurance, general requirements and all other expenses directly connected with construction. The value of any kickbacks, rebates or discounts received or receivable in connection with the construction of the Project shall be subtracted from all items of cost and expense. Any cost or expense attributable to maintaining Contractor's working capital is not to be included within the Actual Cost of Construction.

B. Contractor shall keep accurate records of account of the Actual Cost of Construction, and shall, upon demand, make such records and invoices, receipts, subcontracts and other information pertaining to the construction of the Project available for inspection by Owner, Lender and HUD.

C. With its final application for payment, Contractor shall furnish to Owner a completed "**Contractor's Certificate of Actual Cost**" that shall be accompanied and

supported by an independent public accountant’s or independent certified public accountant’s certificate as to actual cost in form acceptable to HUD.

D. Contractor shall include in all subcontracts, equipment leases and purchase orders a provision requiring the subcontractor, equipment lessor or supplier to certify its costs incurred in connection with the Project, in the event HUD determines there is an Identity of Interest between either Owner or Contractor and any such subcontractor, equipment lessor or supplier.

[Option 2] Article 13: Cost Certification -- Lump Sum Contract

In the event HUD determines that there is an Identity of Interest between Contractor and Owner, Contractor shall certify, on a form prescribed by HUD, its cost incurred in the performance of the Work under this Contract.

Article 14: Designation of Representatives

A. Owner hereby designates _____ as its representative for all communications involving Work performed pursuant to this Contract.

B. Contractor hereby designates _____ as its representative for all communications involving Work to be performed pursuant to this Contract.

Article 15: Mediation and Non-binding Arbitration

Any mediated settlement agreement or non-binding arbitration agreement made pursuant to the General Conditions must be approved by HUD in writing before it will be effective.

Article 16: Headings and Titles

Any heading, section title, paragraph or part of this Contract is intended for convenience only, and is not intended, and shall not be construed, to enlarge, restrict, limit or affect in any way the construction, meaning, or application of the provisions thereunder, or under any other heading or title.

Article 17: Severability

The invalidity of any provision of this Contract shall not affect the validity of any other provision, and all other provisions shall remain in full force and effect.

IN WITNESS WHEREOF, the Parties to these presents have executed this Contract in counterparts, each of which shall be deemed an original.

CONTRACTOR _____
 By (authorized agent): _____
 Printed Name, Title: _____

Name of Entity: _____

OWNER _____

By (authorized agent): _____

Printed Name, Title: _____

Name of Entity: _____

SECTION 006113 – PERFORMANCE AND PAYMENT BONDS

PART 1 - GENERAL

1.1 SUMMARY

- A. AIA Document A312, 2010 Edition, for “Performance Bond”, and “Payment Bond”, is hereby referred to.
- B. Within ten (10) working days of receiving notice of intent to award the contract, prior to the execution of the contract, the successful Bidder shall furnish to the Owner:
 - 1. A Performance Bond in an amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of this Contract,
AND
 - 2. A Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Sum, as security for the payment of all persons performing labor and furnishing materials under this Contract.

END OF SECTION 006113



AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: None See Section 16

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name
and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

Signature: _____

Name
and Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

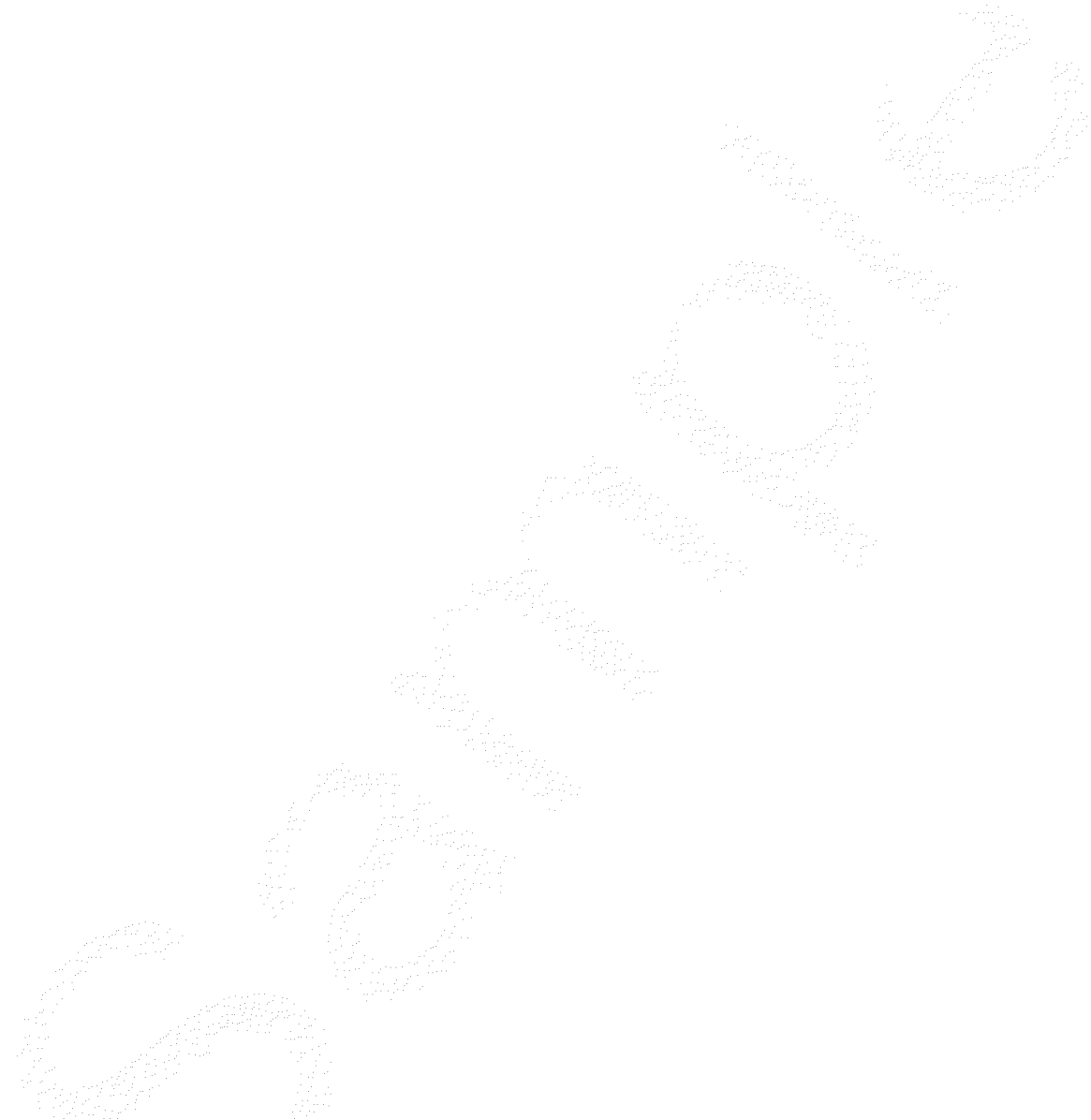
§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:



(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

SURETY

Company: _____ (Corporate Seal)

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address _____

Signature: _____
Name and Title: _____
Address _____



AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT

Date:

Amount:

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: None See Section 18

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____ Signature: _____

Name Name
and Title: and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

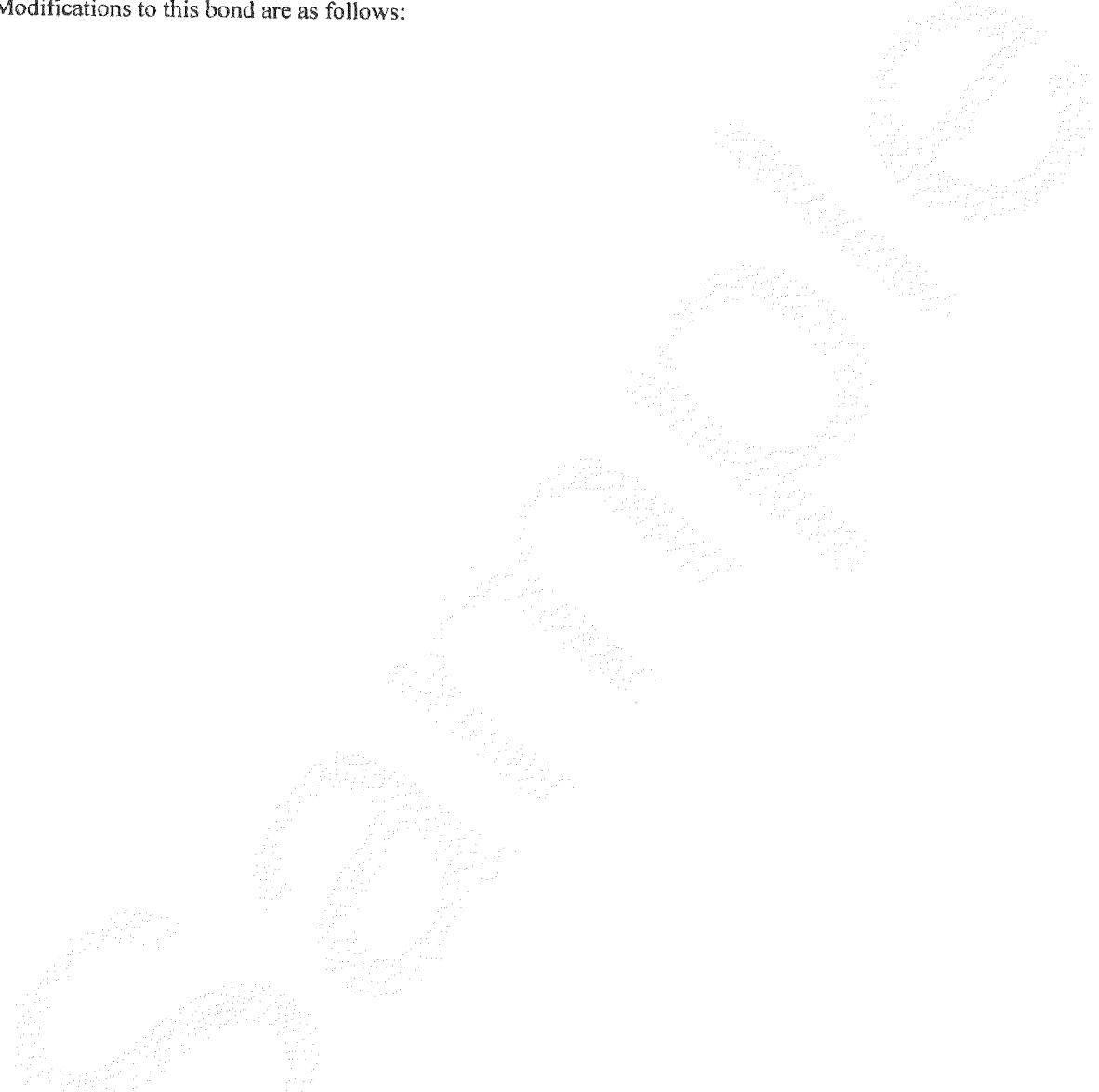
§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:



(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

SURETY

Company: _____ (Corporate Seal)

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address _____

Signature: _____
Name and Title: _____
Address _____

SECTION 007200 - GENERAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The “General Conditions of the Contract for Construction,” AIA Document A201, 2017 Edition, Articles 1 through 15 inclusive, as modified by the Owner, is a part of this contract and is incorporated as fully as if here set forth.

END OF SECTION 007200



AIA[®]

Document A201[®] – 2017

General Conditions of the Contract for Construction

for the following **PROJECT:**

(Name and location or address)

THE OWNER:

(Name, legal status and address)

THE ARCHITECT:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503[™], Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 007300 – SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The U.S. Department of Housing and Urban Development document Supplementary Conditions to the Construction Contract (HUD-92554M) take precedence over, amend and supplement the General Conditions defined in Section 007200 – General Conditions, and other provisions of the Contract Documents as indicated. Provisions that are not so amended or supplemented remain in full force and effect.

END OF SECTION 007300

**SUPPLEMENTARY CONDITIONS
TO THE CONSTRUCTION
CONTRACT**

U.S. Department of Housing
and Urban Development
Office of Housing

OMB Approval No. 2502-0598
(Exp. 9/30/2021)

Public Reporting Burden for this collection of information is estimated to average 0.2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Response to this request for information is required in order to receive the benefits to be derived. This agency may not collect this information, and you are not required to complete this form unless it displays a currently valid OMB control number. While no assurance of confidentiality is pledged to respondents, HUD generally discloses this data only in response to a Freedom of Information Act request.

Warning: Federal law provides that anyone who knowingly or willfully submits (or causes to submit) a document containing any false, fictitious, misleading, or fraudulent statement/certification or entry may be criminally prosecuted and may incur civil administrative liability. Penalties upon conviction can include a fine and imprisonment, as provided pursuant to applicable law, which includes, but is not limited to, 18 U.S.C. 1001, 1010, 1012; 31 U.S.C. 3729, 3802, 24 C.F.R. Parts 25, 28 and 30, and 2 C.F.R. Parts 180 and 2424.

Article 1: Labor Standards

A. Applicability. The Project or program to which the construction work covered by this Contract pertains is being assisted or insured by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract or related instrument pursuant to the provisions applicable to such Federal assistance or insurance. Any statute or regulation contained herein shall also include any subsequent amendment or successor statute or regulation. The terms of this Supplementary Conditions to the Construction Contract (HUD-92554M) takes precedence over all provisions of the "General Conditions of the Contract for Construction" (AIA Document A201) inconsistent with said Supplementary Conditions.

B. Minimum Wages. Pursuant to Section 212 of the National Housing Act, as amended, 12 U.S.C. 1715c, the minimum wage provisions contained in this paragraph B do not apply to those projects with Security Instruments insured under Section 221(h)(1) designed for less than 9 families and they do not apply to those projects with Security Instruments insured under either Section 220 or 233 designed for less than 12 families.

1. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project) shall be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1 (b)(2) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii)) on behalf of laborers or mechanics are considered wages paid to such laborers or

mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii)) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics that is not listed in the wage determination and that is to be employed under this Contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, D.C. 20210 (“**Administrator**”). The Administrator, or an authorized representative, shall approve, modify, or disapprove every additional classification action within thirty (30) days of receipt and so advise HUD or its designee or shall notify HUD or its designee within the thirty (30) day period that additional time is necessary.

(c) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, shall issue a determination within thirty (30) days of receipt and so advise HUD or its

designee or shall notify HUD or its designee within the thirty (30) day period that additional time is necessary.

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs B.1.(ii)(b) or (c) of this Article, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit that is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project), all or part of the wages required by the Contract, HUD or its designee may, after written notice to the Contractor, sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

3. Payrolls, records, and certifications.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the Project). Such records shall contain the name, address, and social security number of each such worker, his or her correct

classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1 (b)(2)(B) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii))), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b)(2)(B) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii)), the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(a) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the Contract, but if the agency is not such a party, the Contractor shall submit the payrolls to the applicant, sponsor, or Owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired, whether paper (Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347.pdf> or its successor site), or electronically pursuant to Program Obligations. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant sponsor, or Owner, as the case may be, for transmission to HUD or its designee, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee.

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or

supervises the payment of the persons employed under the Contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete.

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph B.3.(ii)(b) of this Article.

(d) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Sections 3801 et seq of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under subparagraph B.3.(i) of this Article available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices shall be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship, or with a State Apprenticeship Agency recognized by such Office, or if a person is employed in his or her first ninety (90) days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the

program, but who has been certified by the Office of Apprenticeship, or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where the Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship, or a State Apprenticeship Agency recognized by such Office, withdraws approval of an apprenticeship program, the Contractor shall no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees shall not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on

the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor shall no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.

6. Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs 1 through 10 of this paragraph B and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage determination, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all Contract clauses referenced in this subparagraph.

7. Contract termination and debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor or a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this Contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act (40 U.S.C. 3144(b)(2)) or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act (40 U.S.C. 3144(b)(2)) or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Department . . . makes, passes, utters or publishes any statement, knowing the same to be false . . . shall be fined under this title or imprisoned not more than two years, or both."

C. Contract Work Hours and Safety Standards Act.

1. Applicability and Definitions. This paragraph C of Article 1 is applicable only if a direct form of federal assistance is involved, such as Section 8, Section 202/811 Capital Advance, grants etc., and is applicable only where the prime contract is in an amount greater than \$100,000. As used in this paragraph C, the terms "laborers" and "mechanics" include watchmen and guards.

2. Overtime requirements. No contractor or subcontractor contracting for any part of the Contract work that may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty (40) hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty (40) hours in such workweek.

3. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the immediately preceding subparagraph C.2, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, the Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of such subparagraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty (40) hours without payment of the overtime wages required by the clause set forth in such subparagraph.

4. Withholding for unpaid wages and liquidated damages. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract, or under any other Federal contract with the same prime contractor, or under any other Federally-assisted contract subject to the Contract Work

Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph 3 of this paragraph C.

5. Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs 1 through 5 of this paragraph C and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in such subparagraphs 1 through 5.

D. Certification.

For projects with Security Instruments insured under the National Housing Act, as amended, that are subject to paragraph B of this Article 1, the Contractor is required to execute the Contractor's Prevailing Wage Certificate within HUD-92448 as a condition precedent to insurance by HUD of the Loan, or an advance thereof, made or to be made by the Lender in connection with the construction of the Project.

Article 2: Equal Employment Opportunity

A. Applicability. This Article 2 applies to any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee.

B. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

C. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants shall receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, disability, or national origin.

D. The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a

notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E. The Contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

F. The Contractor shall furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulations or order of the Secretary of Labor, or as otherwise provided by law.

H. The Contractor shall include the provisions of paragraphs A through H of this Article 2 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions shall be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as HUD or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. *Provided, however,* that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by HUD or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Article 3: Equal Opportunity for Businesses and Lower Income Persons Located Within the Project Area

A. This Article 3 is applicable to projects covered by Section 3, as defined in 24 CFR Part 135.

B. The work to be performed under this Contract is on a project assisted under a program providing Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low and very-low income residents of the unit of local government or the metropolitan area (or non-metropolitan county) as determined by HUD in which the Project is located and contracts for work in connection with the Project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the same metropolitan area (or non-metropolitan county) as the Project.

Article 4: Health and Safety

A. This Article 4 is applicable only where the prime contract is in an amount greater than \$100,000.

B. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

C. The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926, and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 USC 3701 et seq.

D. The Contractor shall include the provisions of this Article 4 in every subcontract so that such provisions shall be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as HUD or the Secretary of Labor shall direct as a means of enforcing such provisions.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Work phases.
 - 4. Work under other contracts.
 - 5. Products ordered in advance.
 - 6. Owner-furnished products.
 - 7. Use of premises.
 - 8. Owner's occupancy requirements.
 - 9. Work restrictions.
 - 10. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Western Heights Phase 1
- B. Owner: Knoxville Community Development Corporation (KCDC) and Brinshore Development
- C. Architect: Smith Gee Studio
- D. The Work includes the furnishing of all labor, equipment, materials, tools, machinery, utilities, transportation, insurance, taxes, superintendence, coordination, and miscellaneous services required for the construction and completion of the Work, whether temporary or permanent and whether or not to be finally incorporated into the Work.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 WORK PHASES

- A. Before commencing Work, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all proposed phases of the Work.

1.6 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Furnishings and Owner-Furnished Equipment
 - 2. Communication/Data Services

1.7 PRODUCTS ORDERED BY OWNER

- A. General: Owner may negotiate Purchase Orders with suppliers of materials and equipment to be incorporated into the Work. Owner will assign these Purchase Orders to Contractor when applicable. Costs for receiving, handling, storage if required, and installation of material and equipment shall be included in the Contract Sum.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.

1.8 OWNER-FURNISHED PRODUCTS

- A. Owner may furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.
 - 1. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.
 - 2. Coordinate with Owner to arrange for any necessary Shop Drawings, Product Data, and Samples to be delivered to Contractor.
 - 3. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
 - 4. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products, for incorporation into the Contractor's overall schedule.
 - 5. The Contractor shall provide to the owner a schedule of dates by which products must be in hand for installation, so that the Owner can arrange and pay for delivery of Owner-furnished items without delaying the project.
 - 6. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.

7. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
8. After delivery, inspect delivered items for damage, with Owner's representative present.
9. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
10. Owner will arrange for manufacturer's field services and for execution of manufacturer's warranties to Contractor.
11. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
12. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them at no additional cost to the Owner.

1.9 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations where indicated on Drawings.
- B. Use of Site: Limit use of premises to work in areas within the Contract limits. Do not disturb portions of the site beyond areas in which the Work is indicated.
 1. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Building: Maintain enclosed areas of the building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.10 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 1. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy of each designated area of the Work.
 2. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 3. Upon occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.11 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise permitted by local authorities.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 72 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site when required.

1.12 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 011000

SECTION 012513 – PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

- A. The Owner reserves the right to disallow substitutions. Contractor assumes risks associated with possible rejection of proposals for substitution submitted at any time during the Work of the Contract.
- B. Any request for a substitution shall be in accordance with other Section requirements for Contract Modification Procedures. Substitute products shall not be ordered or installed without written approval or acceptance from Designer and Owner.
- C. Delays caused by the Contractor in preparing and forwarding submittals do not constitute an acceptable basis for consideration of substitute products. Delays due to factors that were in effect or foreseeable prior to project bidding do not constitute an acceptable basis for consideration of substitute products.
- D. When making requests for substitutions, Contractor assumes the following responsibilities:
 - 1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
 - 2. To provide the same warranty for substitute that Contractor would for that specified;
 - 3. To waive all claims for additional costs related to substitution which subsequently become apparent; and,
 - 4. To coordinate installation of the accepted substitute, notifying the Designers of such changes as may be required for Work to be complete and function as intended.
- E. Substitution requests, which do not, at the Designer's discretion, meet the intended or required design criteria will be rejected.

1.3 SUBSTITUTION REQUEST SUBMITTALS

- A. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - 1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.

PRODUCT OPTIONS AND SUBSTITUTIONS

2. Samples, where applicable or requested.
3. A detailed comparison on the same page of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect. All differences in products shall be noted.
4. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the City and separate Contractors that will become necessary to accommodate the proposed substitution.
5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
6. Cost information, including a proposal of the net change, if any in the Contract Sum.

PART 2 - PRODUCTS

2.1 NEW PRODUCTS

- A. Provide new products unless specifically permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 1. Made using or containing CFC's or HCFC's.
 2. Made of wood from newly cut old growth timber.
 3. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 1. If used on interior, have lower emissions or lower off-gassing.
 2. If wet-applied, have lower VOC content.
 3. Have longer documented life span under normal use.
 4. Result in less construction waste.

2.2 HAZARDOUS MATERIALS OR PRODUCTS

- A. Do not incorporate in the Work hazardous materials or products as currently defined in the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or Environmental Protection Agency (EPA) regulations, rules, or requirements, as amended, and/or State and local regulations, rules, or requirements that are equivalent or more stringent than the Federal regulations, rules, or requirements.
- B. In studying the Contract Documents and carrying out the Work, report at once to the Designer the discovery of a product or material that contains or is suspected to contain hazardous materials, components, constituents, waste, or leachate.

PRODUCT OPTIONS AND SUBSTITUTIONS

- C. The Contractor will certify all equipment and materials used in fulfillment of their Contract Responsibilities have no asbestos containing materials, no polychlorinated biphenyl (PCBs), no cellulose or urea formaldehyde, and no lead.
- D. Do not incorporate in the Work a product or material that contains concentrations of a constituent, component, or material above the threshold levels which would require adherence to hazardous waste disposal regulations as currently defined, or could cause a release or threat of release of a hazardous substance at a level that would require a remedial response or removal action as currently defined by RCRA, CERCLA, or the EPA.
- E. Select materials and products meeting specified requirements that comply with EPA provisions as regards hazardous materials content. In making requests for substitutions, determine that materials and products proposed for substitution comply with RCRA, CERCLA, and EPA requirements, and supply chemical constituent information and/or Material Safety Data Sheets (MSDS) with the substitution request.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012513

SECTION 012601 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. See other Division 01 Sections for procedures and adjustments relating to Alternates, Unit Prices, and Allowances.

1.2 SUMMARY

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

1.3 MINOR CHANGES IN THE WORK

- A. Architect may issue supplemental instructions authorizing Minor Changes in the Work which are consistent with the design intent, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

- A. When either a "Request for Information" from the Contractor or a "Proposal Request" from the Architect or Owner results in conditions that may require modifications to the Contract, the Contractor may propose changes by submitting a request for a "Change Order Proposal" to the Architect via the Construction Administrator on forms as required by the Owner.
- B. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within or 14 days after receipt of Proposal Request, unless otherwise specified in the Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

CONTRACT MODIFICATION PROCEDURES

- b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
- 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- D. Proposal Request Form: Use AIA Document G709 for Proposal Requests or a similarly formatted document providing the same information.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. When the Owner and the Contractor disagree on the terms of a "Change Order Proposal" resulting from either a "Request for Information" or "Proposal Request", then the Architect may issue a "Construction Change Directive" on a form acceptable to the Owner.
- 1. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, despite the absence of mutual agreement on the terms, in order to minimize delay on construction progress.
 - 2. Terms for contract adjustments to price and time for the work in the Construction Change Directive will be determined later for subsequent inclusion in a Change Order.

1.6 CHANGE ORDER PROCEDURES

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

CONTRACT MODIFICATION PROCEDURES

1. Form shall be signed by authorized representatives of each of the entities required by the Conditions of the Contract.
- B. Promptly revise the Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item. Adjust the Contract Sum accordingly.
- C. Promptly revise Progress Schedule to reflect any changes in Contract Time, revise subschedules to adjust times for other items of work affected by the change, and resubmit.
- D. Record changes in the Project Record Documents.

END OF SECTION 012601

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms (with Continuation Sheets if necessary).
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than ten (10) days before the date scheduled for submittal of the first Application for Payment.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content:
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value - Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Use CSI's Divisions as basic categories for listing a breakdown of values. Provide at least one line item number for each CSI Division. Provide several line items for Divisions with principal subcontract amounts, where appropriate.
4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
5. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity.
6. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
7. Schedule Updating: Update and resubmit the Schedule of Values before or with each Application for Payment, and when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payment applications shall be submitted to Architect at least ten (10) days before the date established for each application, or before the end of each month, or as otherwise in the Contract. The period covered by each Application for Payment is one month, ending on the last day of the previous month.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect. One copy shall include waivers of lien and similar attachments when required.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit conditional waivers on each item for amounts requested in the current application, after deduction for retainage.
 2. Submit unconditional waivers on each item for amounts requested in previous applications, after deduction for retainage.
 3. When an application shows completion of an item, submit final or full waivers.
 4. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Certificates of insurance and insurance policies.
 11. Performance and payment bonds.
 12. Data needed to acquire Owner's insurance.
- H. Application for Payment at Substantial Completion: After the Certificate of Substantial Completion has been issued, submit an Application for Payment showing the percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete, including, but not limited to, the following:
 - a. A statement showing an accounting of changes to the Contract Sum.
 - b. Occupancy permits and similar approvals.

- c. Executed warranties, guarantees, and maintenance agreements.
 - d. Test/adjust/balance records.
 - e. Meter readings.
 - f. Start-up performance reports.
 - g. Change-over information related to Owner's occupancy, use, operation and maintenance.
 - h. Application for reduction of retainage, and consent of surety.
 - i. Advisement on shifting insurance coverages.
 - j. Operations and Maintenance data and instructions.
 - k. List of incomplete Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
- 1. Completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 6. AIA Document G707, "Consent of Surety to Final Payment."
 - 7. Evidence that any claims have been settled.
 - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 9. Final liquidated damages settlement statement.

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3 COORDINATION

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

PROJECT MANAGEMENT AND COORDINATION

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of the Schedule of Values.
 - 2. Installation and removal of temporary facilities and controls.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Preinstallation conferences.
 - 6. Project closeout activities.
 - 7. Startup and adjustment of systems.
 - 8. Project closeout activities.

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

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if coordination is required for installation of products and materials by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not reproduce the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions of submitted equipment and make specific note of dimensions that appear to be in conflict with the Contract Drawings and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with other contractors.

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1.6 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will receive no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 3. A formal RFI is not required if clarifications are requested at regular progress meetings, and responses are recorded into the meeting minutes for the written record.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name, project number, and recognized project identifiers.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Identify each page of attachments with the RFI number and sequential page numbers, so that all pages stay together.
- D. Software-Generated RFIs: Software-generated files with substantially the same content as indicated above.
1. Attachments shall also be electronic files; Adobe Acrobat PDF format is preferred.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. Architect's action may include a request for additional information, in which case Architect's time for response will start again upon receipt of the desired information.
 2. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

PROJECT MANAGEMENT AND COORDINATION

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within seven days of receipt of the RFI response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. The Log will become part of the Project Record Documents. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five (5) days if Contractor disagrees with response.

1.7 ADMINISTRATIVE LOGS

- A. If any shop drawings, product data, or sample submittals are required by the Contract Documents, maintain a submittals log to record the status of submittals made to the Designer.
1. Submit an updated copy with each application for payment.
 2. Record activities with respect to shop drawings, product data, samples, and such other submittals which are required by the Contract Documents.
 3. Indicate for each submittal made to date:
 - a. Title or name, and type of submittal.
 - b. Date received and reviewed by the Contractor.
 - c. Date sent to the Designer.
 - d. Designer's response and date returned.
- B. Maintain visitor log in the field office (or with the Project Superintendent when no field office is required) to record visits by all persons not a part of the Contractor's forces, materials suppliers, or subcontractors' forces.
1. Submit an updated copy with each application for payment.
 2. Indicate:
 - a. Visitor name and affiliation.
 - b. Date of visit.
 - c. Times of arrival and departure.

END OF SECTION 013100

SECTION 013119 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 SCHEDULING AND ATTENDANCE

- A. The Architect, Owner and Contractor will schedule and conduct a Pre-Construction Conference, periodic Progress Meetings, and other specially called or required meetings.

1.2 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a Pre-Construction Conference prior to mobilization.
- B. The Pre-Construction Conference shall be attended by the Contractor's:
 - 1. (Office) Project Manager
 - 2. (Field) Job Superintendent
 - 3. Major subcontractors' representatives
 - 4. Major suppliers' representatives
- C. The Pre-Construction Conference is intended to be an opportunity for the Contractor to review administrative, procedural, and temporary facilities requirements of the Contract Documents.
 - 1. Review sequencing and coordination of the work, and project schedule.
 - 2. Review administrative requirements for written and oral communications.
 - 3. Review status of permits required and payment of permitting fees.
 - 4. Review staging and storage areas, parking areas, and site access.

1.3 OAC PROGRESS MEETINGS

- A. Progress Meetings will be scheduled and conducted at the project site prior to the Contractor's submittal of an application for payment, once a month or when deemed advisable by the Architect or Owner.
- B. Representatives of the Owner and the Architect will attend.
- C. Progress Meetings shall be attended by the Contractor's:
 - 1. (Office) Job Manager
 - 2. (Field) Job Superintendent
 - 3. Subcontractors' representatives, as befits the agenda
 - 4. Suppliers' representatives, as befits the agenda
- D. Representatives of the Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

- E. Progress Meetings are intended to be a monthly opportunity for the Contractor to review and submit applications for payment and attachments, and for a general review of the progress of the Work, aimed at identifying and mitigating impediments to timely completion.
- F. Progress Meetings will be scheduled and conducted until final completion.

1.4 CONTRACTOR COORDINATION MEETINGS

- A. Conduct Project coordination meetings at a minimum of bi-weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule to each participant, Owner, and Architect concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance, to Architect and Owner, and to others affected by decisions or actions resulting from each meeting.

1.5 PRE-INSTALLATION MEETINGS

- A. When specified in individual product specification Sections or when necessary to ensure coordination, convene a pre-installation conference prior to commencing Work specified in individual product Sections.
- B. Require attendance by representatives of firms whose activities directly affect or are affected by Work to be installed.
- C. Review conditions of installation, preparation and installation procedures and coordination with related Work and work under separate contracts, including:
 1. Contract Documents and related Change Orders
 2. Options or Substitutions, requests and procedures for approvals
 3. Review of mockups
 4. Possible conflicts or material compatibility problems
 5. Time schedules
 6. Weather limitations
 7. Manufacturer's written recommendations and installation instructions
 8. Warranty requirements.
 9. Acceptability of substrates and current conditions
 10. Testing and inspecting requirements
 11. Required performance results.
- D. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work.

END OF SECTION 013119

SECTION 013200 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the schedule developed, monitored and maintained by the Contractor and used by the Project Team during the Construction phases of the project.

1.3 PURPOSE

- A. Time is an essential part of this contract. Therefore, the timely and successful completion of the Work requires careful planning and scheduling of all activities inherent in the completion of the project.
- B. The Schedule shall be coordinated with the Contract Price Breakdown, or Schedule of Values, and shall include all significant procurement actions (including long leadtime delivery items and related approval activities), all work placement activities (including start and completion dates), identification of the timing of overhead inspections, system startup and commissioning activities, pre-final and final inspections, and punch list corrections as a minimum.
- C. Acceptance of the Project Schedule; or any subsequent update thereof, by the Owner is for format and extent of detail of the Project Schedule only. Such “acceptance” does not indicate approval of the Contractor’s means or methods, or of any change to the contract terms including without limitation any required contract milestones.
- D. The Owner must be able to reasonably rely on the Contractor’s Project Schedule in order to make accurate commitments to the Project Team, utility providers, and other parties as necessary.

1.4 DEFINITIONS

- A. Critical Path activities are defined as Work activities, which, if delayed or extended, will delay or extend the scheduled completion of the Work. All other work activities are defined as non-critical path activities and are considered to have associated float.
- B. Float is defined as the time a non-critical work activity can be delayed or extended without changing the scheduled completion of milestones or the scheduled completion of the Work.

1. Delays of non-critical Work shall not be the basis for an extension of Contract Time unless unforeseen delays consume all float time and cause the activity to affect the Critical Path.

1.5 CONTENTS OF SCHEDULE

- A. The schedule shall provide sufficient detail and clarity so that the contractor can plan and control the work and Owner and the Architect can readily monitor and follow the progress of all portions of the work. The critical activities must be clearly shown.
- B. Identify the following milestone events on the Schedule:
 1. Mobilization
 2. Earthwork & grading
 3. Foundations
 4. Structural framing
 5. Underground and under-slab rough-ins
 6. Building envelope
 7. Interior finishes
 8. Plumbing & electrical finishing
 9. HVAC equipment setting and finishing
 10. Sitework finishing (paving, curbs, etc)
 11. Landscaping
 12. Punchlist
- C. Dates shall be shown for the procurement, fabrication, delivery, and installation of major equipment, materials, and building elements.
- D. Dates shall be shown for scheduled inspections required by codes, systems testing, and utility connections or disconnections, temporary and permanent.
- E. Identify all holidays and non-working days on the schedule.

1.6 SUBMITTALS

- A. Within ten (10) days of the Award of Contract, the Contractor shall submit to the Owner and Architect a proposed Construction Schedule for review and discussion.
- B. Neither the Architect nor Owner's review and/or comments shall indicate approval/disapproval of the schedule. Since the schedule is dependent on the Contractors' proprietary information and commitments, the Architect and Owner cannot and will not warrant the schedule to be correct and sufficient to meet the required contract dates.
- C. Once the Baseline Project Schedule has been accepted, the Contractor shall update the Project Schedule on at least a monthly basis and submit a copy of the current Schedule with Applications for Payment.

1.7 DELAYS AND TIME EXTENSIONS

- A. Any Change Order Proposal that the Contractor claims will require an extension of the Contract Time must contain the information necessary to justify the time extension.
- B. The Owner may extend the Contract Time by the number of excusable calendar days necessary, or take other actions as appropriate under the terms of the contract, via a Change Order as described in Division 1 section "Contract Modification Procedures."
- C. Change Order Proposals that do not affect the Critical Path for the Project and delay the Substantial Completion Date, or does not include a request for additional time prior to approval by the Owner, shall not be due a time extension.
- D. Once the Owner accepts a time extension and executes a Change Order authorizing the Contractor to proceed with the contract change, the proposed revision shall be incorporated into the updated Project Schedule.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 4. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's or Owner's responsive action.
- B. Informational Submittals: Written information that does not require responsive action. Submittals may be rejected for not complying with requirements.
- C. Digital Signature: An electronic signature based upon cryptographic methods of originator authentication, computed by using a set of rules and a set of parameters such that the identity of the signer and the integrity of the data can be verified. A computer data compilation of any symbol or series of symbols executed, adopted, or authorized by an individual to be the legally binding equivalent of the individual's handwritten signature.
- D. Facsimile: An exact copy or scan of any paper document, including handwritten signatures.

1.4 SUBMITTAL PROCEDURES

- A. Format: Preferred electronic file format is .PDF.
 - 1. Hard copies of certain documents may be required as indicated or appropriate.

2. Digital signatures and facsimiles of handwritten signatures and notations shall have the same force and effect as if occurring on paper documents.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow ample time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Project number
 - c. Date.
 - d. Name and address of Architect.
 - e. Name and address of Contractor.
 - f. Name and address of subcontractor.
 - g. Name and address of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
- E. Deviations: Highlight, Encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will not review submittals received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating approval notation from Architect's and Engineer's action stamp.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.

- j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
- C. Submit electronic submittals via email as electronic files, to the Architect. If applicable, the Architect will forward submittals to other Design Professionals for additional review. The Architect or Owner may request paper copies of certain submittals for coordination.
 1. The Architect will return an annotated file. Retain the file as an electronic Project record document file. The Contractor shall print copies of the submittal as necessary for his distribution to subcontractors and field workers.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Do not copy the contract document drawings. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Shop Drawings may be submitted either via email as electronic files, or in hard-copy prints. PDF file format is preferred, formatted to be printable at a legible scale on common sheet sizes.
 - a. Number of Hard Copies, when applicable: Submit a minimum of three (3) identical copies of each submittal.
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit a minimum of three (3) pieces or sets of Samples.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit either electronic files, or a minimum of two copies of each physical submittal, unless otherwise indicated. Architect will not return informational submittals.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a minimum of three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014200 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Owner": For this project, designated representatives for the Knoxville Community Development Corporation (KCDC), and the developers, Brinshore Development.
- C. "Designer": Design professional registered to practice in the state in which the project is located. This shall be a Registered Architect for the design of all new structures, additions, and renovations or alterations to existing structures. The scope of the Architect's services shall include the services of professional engineers to design the structural, plumbing, mechanical, and electrical portion of the project. The services of the Architect may be deleted and comparable services of an engineer or landscape architect may be substituted in where a project is entirely within the design realm of such professionals.
- D. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Contractor is to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Contractor is to furnish and install, complete and ready for the intended use.

1.3 INDUSTRY STANDARDS

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

1.4 ABBREVIATIONS AND ACRONYMS

- A. Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
 - 1. ETHDC East Tennessee Housing Development Corporation
 - 2. CAC Knoxville-Knox County Community Action Committee
 - 3. KEMA Knoxville-Knox County Emergency Management Agency
 - 4. SFMO State Fire Marshal's Office
 - 5. HUD U.S. Department of Housing and Urban Development
 - 6. TDOT Tennessee Department of Transportation
 - 7. TDH Tennessee Department of Health
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
 - 1. AASHTO American Association of State Highway and Transportation Officials
 - 2. ACI American Concrete Institute
 - 3. ACPA American Concrete Pipe Association
 - 4. AGC Associated General Contractors of America (The)
 - 5. AIA American Institute of Architects (The)
 - 6. AISC American Institute of Steel Construction
 - 7. AISI American Iron and Steel Institute
 - 8. ALSC American Lumber Standard Committee, Incorporated
 - 9. ANSI American National Standards Institute
 - 10. APA Architectural Precast Association
 - 11. APA APA - The Engineered Wood Association
 - 12. APA EWS APA - The Engineered Wood Association; Engineered Wood Systems
 - 13. ARI Air-Conditioning & Refrigeration Institute
 - 14. ARMA Asphalt Roofing Manufacturers Association
 - 15. ASCE American Society of Civil Engineers
 - 16. ASCE/SEI American Society of Civil Engineers/Structural Engineering Institute

17.	ASHRAE	Am. Society of Heating, Refrigerating and Air-Conditioning Engineers
18.	ASME	ASME International
19.	ASTM	ASTM International
20.	AWI	Architectural Woodwork Institute
21.	AWPA	American Wood Protection Association
22.	AWS	American Welding Society
23.	BHMA	Builders Hardware Manufacturers Association
24.	BIA	Brick Industry Association (The)
25.	BIFMA	Business and Institutional Furniture Manufacturer's Assoc. International
26.	BOCA	Building Officials and Code Administrators International
27.	CRI	Carpet and Rug Institute (The)
28.	CRSI	Concrete Reinforcing Steel Institute
29.	CSI	Construction Specifications Institute (The)
30.	DHI	Door and Hardware Institute
31.	EIMA	EIFS Industry Members Association
32.	FM Approvals	Factory Mutual Approvals LLC
33.	FM Global	FM Global
34.	FSC	Forest Stewardship Council
35.	GA	Gypsum Association
36.	GANA	Glass Association of North America
37.	HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
38.	HPW	H. P. White Laboratory, Inc.
39.	ICBO	International Conference of Building Officials
40.	IESNA	Illuminating Engineering Society of North America
41.	IGCC	Insulating Glass Certification Council
42.	IGMA	Insulating Glass Manufacturers Alliance
43.	ILI	Indiana Limestone Institute of America, Inc.
44.	ISO	International Organization for Standardization
45.	KCMA	Kitchen Cabinet Manufacturers Association
46.	MBMA	Metal Building Manufacturers Association
47.	MFMA	Metal Framing Manufacturers Association, Inc.
48.	MIA	Marble Institute of America
49.	MPI	Master Painters Institute
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NCMA	National Concrete Masonry Association
52.	NEMA	National Electrical Manufacturers Association
53.	NFPA	NFPA National Fire Protection Association
54.	NFRC	National Fenestration Rating Council
55.	NGA	National Glass Association
56.	NRCA	National Roofing Contractors Association
57.	OSHA	U.S. Occupational Safety and Health Administration
58.	PCI	Precast/Prestressed Concrete Institute
59.	PTI	Post-Tensioning Institute
60.	SAE	SAE International
61.	SDI	Steel Deck Institute
62.	SDI	Steel Door Institute
63.	SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers
64.	SGCC	Safety Glazing Certification Council

65. SJI Steel Joist Institute
 66. SMACNA Sheet Metal and Air Conditioning Contractors'
 67. SMPTE Society of Motion Picture and Television Engineers
 68. TCA Tile Council of America, Inc.
 69. TCNA Tile Council of North America, Inc.
 70. TPI Truss Plate Institute, Inc.
 71. UL Underwriters Laboratories Inc.
 72. USGBC U.S. Green Building Council
 73. WCSC Window Covering Safety Council
 74. WDMA Window & Door Manufacturers Association
 75. WI Woodwork Institute
 76. WWPA Western Wood Products Association
- C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.
1. AHERA Asbestos Hazard Emergency Response Act of 1987
 2. CFR Code of Federal Regulations
 3. DOD Department of Defense Military Specifications and Standards
 4. FED-STD Federal Standard
 5. FS Federal Specification
 6. FHAG The HUD Fair Housing Accessibility Guidelines
 7. FHADM The HUD Fair Housing Act Design Manual
 8. HUD Handbook 4910 The HUD Minimum Property Standards for Housing
 9. MAP Guide The HUD Multifamily Accelerated Processing Guide (4430.G)
- D. Accessibility Standards and Regulations:
1. ADAAG ADA Accessibility Guidelines for Buildings and Facilities
 2. ADA Americans with Disabilities Act (USC Title 42, Chapter 126)
 3. ABA Architectural Barriers Act (USC Title 42, Chapter 51)
 4. ICC A117.1 Accessible and Usable Buildings and Facilities
 5. Title II Nondiscrimination on the Basis of Disability in State and Local Government Services (CFR Title 28, Chapter 1, Part 35)
 6. Title III Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities (CFR Title 28, Chapter 1, Part 36)
 7. ATBCB Architectural and Transportation Barriers Compliance Board
 8. UFAS Uniform Federal Accessibility Standards

END OF SECTION 014200

SECTION 014500 – QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Definitions, Qualifications, Contractor Responsibilities, and other provisions as indicated in Section 014533 Code-Required Special Inspections.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality control during construction.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
- C. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

1.3 DEFINITIONS

- A. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements.
- B. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
 - 1. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications where specified in individual Sections; and that is acceptable to the AHJ.

1.4 CLARIFICATIONS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Request clarification from the Designer for conflicting requirements that are different and it is unclear which should govern.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Request clarification for uncertainties from the Designer for a decision before proceeding.
- C. Comply with manufacturers' instructions, including each step in sequence, wherever possible. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Designer before proceeding.

1.5 CONTRACTOR'S QUALITY CONTROL PLAN

- A. Prepare a quality-control plan and a comprehensive schedule of Work requiring testing or inspection. Identify the following types of tests and inspection:
 - 1. Owner-performed tests and inspections required by the Contract Documents and by the authorities having jurisdiction for code-required special inspections.
 - 2. Contractor-performed test and inspections whether required or elective, including those by sub-contractors.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTATION

- A. Monitoring and Documentation: Maintain testing and inspection reports and logs, including approved and rejected results. Include work the Designer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.
- B. Manufacturer's Technical Representative's Field Reports and Factory-Authorized Service Representative's Reports: Prepare and maintain written information documenting technical representative's tests and inspections specified in other Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 RESPONSIBILITIES

- A. Except where indicated, the Owner will employ and pay for an independent testing laboratory to perform inspections, tests, and other quality control services specified elsewhere in Contract Documents and required by authorities having jurisdiction.
- B. Where individual Sections specifically indicate that certain inspections, tests, and other quality control services are Contractor's responsibility, Contractor shall employ and pay qualified independent testing agency to perform quality control services. Costs for these services shall be included in Contract Sum.
- C. Re-testing: Contractor is responsible for costs of retesting where results of any inspections, tests, or other quality control services are unsatisfactory and indicate noncompliance with Contract Document requirements.
- D. Contractor shall be responsible for obtaining manufacturer's field and technical services where required to inspect field-assembled components and installations.
 - 1. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Associated Services: Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - 1. Provide access to Work.
 - 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 - 3. Delivery of samples to testing agencies.
 - 4. Assist agencies as requested in taking quantities of representative samples of materials that require testing.

5. Provide facilities for storage and curing of test samples, including security and protection of samples, in a manner acceptable to the testing agency.

- F. Inspections and Tests by Utilities: Contractor shall be responsible for all tests and inspections required by serving utilities to be made for Work under the Contract. Except where specifically noted, scheduling, coordinating and conducting such inspections and tests shall be solely the Contractor's responsibility.
 1. All time required for inspections and tests by serving utilities shall be included in the Contract Time.
 2. Except where specifically noted, all costs for inspections and tests by serving utilities shall be included in the Contract Sum.

PART 2 - PRODUCTS (Not Used.)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. Protect construction exposed by or for quality-control service activities.

- B. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014500

SECTION 014533 – CODE REQUIRED SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with the currently enforced editions of the International Building Code (IBC).
- B. Structural testing and special inspection services are intended to assist in determining probable compliance of the work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the contract documents.

1.2 DEFINITIONS

- A. Registered Design Professional: The licensed Professional Engineer or Registered Architect whose seal appears on the Construction Drawings. Unless noted otherwise, references to the Registered Design Professional in this section refer to the Structural Engineer for the building design.
- B. Code Enforcement Official: The Officer or other designated authority charged with administration and enforcement of the Building Code.
- C. Testing/Inspecting Agency: An agent retained by the Special Inspector or by the Owner and coordinated by the Special Inspector, to perform some of the inspection services on behalf of the Special Inspector.
- D. Statement of Special Inspections: A document prepared by the Registered Design Professional and filed with and approved by the Code Enforcement Official that includes the Schedule of Special Inspections listing the materials and work requiring Special Inspections. This document includes the inspections and verifications required for the project and the individuals, agencies, or firms who will be retained to perform these services.
- E. Continuous Special Inspection: The full-time observation of work requiring Special Inspections by the Special Inspector who is present in the area where the work is being performed.
- F. Periodic Special Inspections: The part-time or intermittent observation of work requiring Special Inspections by the Special Inspector who is present in the area where the work has been or is being performed and at the completion of the work.

1.3 CONDITIONS

- A. Work shall be checked as it progresses. Failure to detect any defective work or materials shall not prevent later rejection if defective work or materials are discovered, nor shall it obligate Owner to accept such work.
- B. Structural testing, special inspection, and periodic inspections by the Building Official do not relieve the Contractor of any responsibility to complete the work in accordance with the approved drawings and specifications.
- C. Testing agents and/or special inspectors may not waive or alter contract requirements, or approve or accept any portion of the work unless specifically authorized by the Architect or SER. They may not assume any duties of the Contractor, and they have no authority to stop or reject work.

1.4 QUALIFICATIONS

- A. The Special Inspector shall be a Professional Engineer licensed in the State in which the work is being performed, who is accepted by the Engineer of Record, Architect of Record, the Owner, and by the Code Enforcement Official.
- B. Special Inspections shall be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-In-Training (EIT) with an education and background in structural engineering except as indicated below:
 - 1. Special Inspections of soils and foundations may be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-In-Training (EIT) with an education and background in geotechnical engineering.
 - 2. Technicians performing tests of concrete shall be ACI Certified Concrete Field Technicians - Grade 1 or higher.
 - 3. Inspectors performing inspections of concrete work may be ACI Certified Concrete Construction Inspectors or other qualified individuals with experience inspecting concrete work, designated and supervised by the Special Inspector.
 - 4. Inspectors performing inspections of other work such as masonry, wood framing, and steel framing may be qualified individuals with experience inspecting such work, designated and supervised by the Special Inspector.
 - 5. Technicians performing tests or inspections of welds shall be AWS Certified Welding Inspectors. Technicians performing ultrasonic testing shall also be certified as an SNTTC Level II or Level III technician.
 - 6. Technicians performing standard tests described by specific ASTM standards shall have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be performed. They shall not be permitted to independently evaluate test results.
 - 7. Technicians of Testing/Inspecting Agencies for smoke control shall have expertise in fire-protection engineering and mechanical engineering and shall have certification as air balancers.

1.5 RESPONSIBILITIES

A. Special Inspectors:

1. The Special Inspector shall provide or coordinate inspection and testing requirements as necessary in accordance with the provisions of the Building Code of the State of Tennessee, these specifications, and the Statement of Special Inspections included in the drawings.
2. Inspect the work assigned for conformance with the building department approved plans, specifications, and applicable material and workmanship provisions of the code. Perform inspection in a timely manner to avoid delay of work.
3. Bring nonconforming items to the immediate attention of the Contractor for correction. If not corrected within 24 hours, or if inspector will not be on site the following day, bring to the attention of the Architect by the end of the business day. If uncorrected after a reasonable period of time, bring to the attention of the Building Official, and to the Owner. Notify the Architect immediately if non-conforming items are enclosed, embedded, or obscured prior to verification of correction.
4. Submit inspection reports to the Building Official, Contractor, the Architect, the Engineer of Record, and other designated persons in accordance with the structural testing and special inspection schedule.
5. Submit a final signed report stating whether the work requiring special inspection was, to the best of his/her knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.

B. Testing Agency:

1. Test the work assigned for conformance with the building department approved plans, specifications, and applicable material provisions of the documents. Perform tests in a timely manner to avoid delay of work.
2. Submit test reports to the Special Inspector, and other designated persons in accordance with the structural testing and special inspection schedule.

C. Contractor:

1. Post or make available the structural testing and special inspection schedule within its office at the job site. Also, provide adequate notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
2. Provide special inspectors access to the latest set of the approved Construction Documents, supplemental drawings, accepted shop drawings, and specifications at the job site.
3. Review all reports issued by special inspectors.
4. Retain, at the job site, all reports submitted by the special inspectors for review on the Building Official's request.
5. Correct deficiencies identified in inspection or testing reports in a timely manner.
6. Provide safe access to the work requiring inspection or testing.
7. Provide labor and facilities to provide access to the work, to obtain, handle and deliver samples, to facilitate testing and inspection and for storage and curing of test samples.
8. Verify conformance of the work with specified construction tolerances.

CODE REQUIRED SPECIAL INSPECTIONS

1.6 SUBMITTALS

- A. The Special Inspector and Testing/Inspecting Agency shall submit to the Registered Design Professional and Code Enforcement Official a copy of their qualifications for review, including the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing/Inspecting Agency shall disclose past or present business relationship or potential conflict of interest with the Contractor or Subcontractors whose work will be inspected or tested.

1.7 INSPECTION NOTICE

- A. Contractor shall provide minimum of 5 working days prior to starting work and 3 working days prior to continuing work for all items requiring testing or inspection. Items requiring testing and inspection services prior to or during placement shall not be placed until testing and inspection services are available. Items requiring testing and inspection services after placement shall not be enclosed or obscured until testing and inspection services are performed. If the Work is covered up prior to any required testing or observation, it shall be uncovered for review at the Contractor's expense.

1.8 REPORTS

- A. Detailed reports shall be prepared of each test or inspection. Reports shall include:
 - 1. Date of test or inspection.
 - 2. Name of Testing Agency or Inspecting Agency.
 - 3. Name of technician or inspector.
 - 4. Locations of specific areas tested or inspected.
 - 5. Description of test or inspection and results.
 - 6. Reference to applicable ASTM standard.
 - 7. Weather conditions.
- B. The Testing/Inspecting Agency shall submit reports to the Special Inspector and the Registered Design Professional within 7 days of the inspection or test.
- C. The Testing/Inspecting Agency shall immediately notify Contractor, Special Inspector, and Registered Design Professional of test results failing to comply with the requirements of the Contract Documents.
- D. The Special Inspector shall immediately notify Contractor of discrepancies from the Contract Documents found during a Special Inspection. If discrepancies are not corrected before the Special Inspector leaves the site, the Special Inspector shall notify the Registered Design Professional within 24 hours (one business day) and issue a non-conformance report. If discrepancies are not corrected by the time of substantial completion or other appropriate time, the Special Inspector shall notify the Code Enforcement Official.

CODE REQUIRED SPECIAL INSPECTIONS

- E. The Special Inspector shall submit reports to the Registered Design Professional within 7 days of the inspections. In addition, the Special Inspector shall submit interim reports at intervals noted in the Statement of Special Inspection, including reports for inspections and tests performed since the previous interim report or since the beginning of construction for the first interim report.
- F. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the Registered Design Professional and Code Enforcement Official, stating that, to the best of the Special Inspector's knowledge, the Work requiring special inspection conformed to the Contract Documents.

1.9 PROTECTION AND REPAIR

- A. Upon completion of testing, sample-taking, or inspection, the Contractor shall repair damaged Work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect/Engineer. Protect Work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

1.10 PAYMENT

- A. The Owner will employ and pay for services of the Special Inspectors and testing agency to perform required structural testing and special inspections as mandated by code.
- B. The Contractor shall provide and pay for all materials, samples, mock-ups, and assemblies required for testing and inspection and shall pay for shipping costs related to delivery of such items to the Owner's designated testing agency testing facility.
- C. If items requiring testing or inspection are enclosed, embedded or obscured prior to testing or inspection or if such items are placed without tests or inspections, the Contractor shall pay for the costs of any exploratory work deemed necessary by the Architect/Engineer to verify compliance with the Contract Documents.
- D. When any testing or observations indicate the Work is non-compliant with the Contract Documents, all retesting and re-observations shall be performed by the Owner's testing or observation agencies. All costs for retesting and re-observations, including additional services of the design professionals, the design professional's consultants and the Owner's consultants are the Contractor's responsibility and shall be deducted from the Contract Sum by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SPECIAL INSPECTIONS

- A. The following sections represent minimum special inspection requirements typically required. Required inspections and tests are described in the Schedule of Special Inspections included in the structural and civil drawings and in the individual specification sections for the items to be inspected or tested.
- B. EARTHWORK
1. Determine site has been prepared in accordance with approved soils report and Civil specifications prior to placement of fill materials.
 2. Verify fill materials used, maximum lift thickness placed and compaction obtained comply with requirements.
 3. Classify materials used and encountered during construction per ASTM D2488 and ASTM D2487.
 4. Perform field density testing and laboratory testing of materials.
 5. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved.
 6. Document presence of groundwater within excavations.
 7. Verify cut and fill slopes as specified in Contract Documents.
 8. Conventional Testing and Inspections Requirements: Verify footings comply with frost depth requirements and report any variances to Engineer in a timely manner.
 9. Provide reports of subgrade observations and periodic test results for general compliance with Contract Documents and Geotechnical Report.
- C. CONCRETE FORM WORK
1. Verify formwork for all concrete, excluding slabs on grade, strip footings without transverse reinforcement and topping slabs, will result in member size, location and configuration as described on the contract documents, only as it affects the structural integrity of the concrete elements to be placed.
- D. CONCRETE REINFORCEMENT
1. Inspect reinforcement in all cast-in-place concrete, excluding slabs on grade, footings without transverse reinforcement, and topping slabs.
 2. Verify reinforcing bar grade.
 3. Verify reinforcing bars are free of dirt, excessive rust and damage.
 4. Verify reinforcing bars are adequately tied, chaired and supported to prevent displacement during concrete placement.
 5. Verify proper clear distances between bars and to surfaces of concrete.
 6. Verify reinforcing bar size and placement.
 7. Verify bar laps for proper length and stagger and bar bends for minimum diameter, slope and length.

CODE REQUIRED SPECIAL INSPECTIONS

8. Verify mechanical splices are placed in accordance with Contract Documents and reviewed shop drawings.
9. Verify epoxy coating is present at locations noted on the Contract Documents, include tie wires, chairs, bolsters, etc. Verify coating damage is repaired in accordance with the Contract Documents.

E. CAST-IN-PLACE CONCRETE

1. Sample and test all cast-in-place concrete. (Technical I)
2. Make, cure and determine strength of concrete test cylinders cast in field. Perform in accordance with ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete, ASTM C31 - Practice for Making and Curing Concrete Test Specimens in the Field and ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. Evaluation and acceptance of concrete shall be in accordance with ACI 318.
3. Slump: Determine slump of concrete in accordance with ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete. Perform 1 test for each set of test cylinders. Test at point of discharge for each truck. Test before and after high range water reducer is added on site, if applicable.
4. Air Content: Determine air content of fresh concrete, when air content is specified, in accordance with ASTM C173 or ASTM C231. Where placement is by pump, air content shall be measured at location of placement. For concrete exposed to freezing and thawing, concrete from each truck shall be tested and concrete not meeting specified percentages shall not be placed. For interior concrete not exposed to freezing and thawing, such as lightweight concrete on metal decking, perform 1 test for each set of test cylinders. Concrete used in performing air content test shall not be used in fabricating test specimens.
5. Unit Weight: Make, transport, and cure specimens as required to determine unit weight of structural lightweight concrete in accordance with ASTM C567 – Standard Test Method for Unit Weight of Structural Lightweight Concrete and ASTM C138 – Standard Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete.
6. Perform concrete mix verification.
 - a. Verify mixer truck trip ticket conforms to approved mix design.
 - b. Verify that total water added to mix on site does not exceed that allowed by concrete mix design.
 - c. Verify that concrete quality is indicative of adequate mixing time, consistency and relevant time limits (discharge within 60 minutes of batching for air entrained concrete and 90 minutes for non air-entrained concrete.)
7. Batch plant inspection: Verify batching tolerance is not exceeded (random basis).
8. Floor Flatness and Levelness: Test compliance with specified values per ASTM E1155.
9. Inspect preparation and placement of all concrete, excluding strip footings without transverse reinforcement.
 - a. Verify acceptable general condition of concrete base prior to placement.
 - b. Verify that concrete conveyance and depositing avoids segregation and contamination.
 - c. Verify that concrete is properly consolidated.
 - d. Verify reinforcement remains at proper location.
 - e. Verify underfloor vapor barrier/retarder is properly installed and not damaged during concrete placement.

10. Observe protection and curing methods for all concrete, excluding strip footings without transverse reinforcement.
 - a. Verify specified curing procedures are followed.
 - b. Verify that specified hot and cold weather procedures are followed.
11. Inspect all embedded anchors installed in concrete.
 - a. Verify specified size, type, spacing, configuration, embedment and quantity.
 - b. Verify proper concrete placement and consolidation around all embedded anchors.

F. MASONRY

1. Special inspection of masonry is required during preparation of masonry wall prisms, sampling and placing of masonry units, placement of structural reinforcement, cleanout of grout space immediately prior to closing of elements and during all grouting operations.
2. "Continuous" Inspection of Masonry: Inspections noted below as being continuous shall be performed uninterrupted each day while the specific task is being performed.
 - a. Continuous inspection shall be provided for 100% of shear walls, masonry beams and masonry columns.
3. "Periodic" inspection of masonry: Inspection items noted below as being periodic shall be performed at least once per 1,000 square feet of surface but not less than once per week.
4. Samples and Tests for Special Inspections:
 - a. Construction Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof, but not less than one set for the project.
 - b. One set shall consist of testing three samples.
5. Masonry Unit Tests – Perform in accordance with IBC Chapter 21.
 - a. For each type of unit provided, verify units conform to strength, absorption, and unit weight requirements of ASTM C 55 or ASTM C 90 when tested in accordance with ASTM C 140.
6. Masonry Prism Tests – Perform in accordance with IBC Chapter 21.
 - a. For each type of construction provided, verify compressive strength of masonry equals or exceeds specified f'_m when tested in accordance with ASTM C1314.
 - b. Preparation, storage, handling of prism tests: Contractor will provide labor and materials to construct all prism tests.
7. Mortar Tests for Unit Masonry Complying with ASTM C270 Proportion Specifications:
 - a. For each mix provided, test mortar for initial consistency and board life, mortar aggregate ratio, and mortar air content in accordance with ASTM C780.
8. Mortar Tests for Unit Masonry Complying with ASTM C270 Property Specifications:
 - a. For each mix provided, test mortar for initial consistency and board life, mortar air content and compressive strength in accordance with ASTM C 780.
9. Flexural Bond Strength Testing: For each type of construction provided at the following applications, test mortar for flexural bond strength in accordance with ASTM E 518 or ASTM C 1072.
10. Grout Testing for each mix provided:
 - a. Test grout for temperature in accordance with ASTM C 1064.
 - b. Test grout for slump in accordance with ASTM C 143.
 - c. Test grout for strength in accordance with ASTM C 1019. One set of 4 prisms for every 500 square feet of wall area or floor lever (whichever is less to give the most tests). One prism is tested at 7 days and 3 at 28 days.
11. Masonry Preparation and Placement

CODE REQUIRED SPECIAL INSPECTIONS

- a. Condition of Units: On a periodic basis, verify that masonry units are clean, sound and dry.
 - b. Proportions of site prepared mortar: On a periodic basis, verify proportions of prepared mortar are consistent with previously submitted materials.
 - c. Placement: On a periodic basis, inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.
 - d. Joints: On a periodic basis, inspect construction, expansion and contraction joints for location and continuity of steel.
 - e. On a continuous basis, verify hot and cold weather procedures are followed.
 - f. On a continuous basis, verify wall cavities are protected against entry of precipitation.
12. Masonry Reinforcement
- a. Vertical Reinforcement: On a continuous basis inspect placement and alignment of all vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls and positioning of steel.
 - b. Horizontal Reinforcement: On a periodic basis, inspect horizontal joint reinforcement (HJR) steel and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearance to masonry units and outside face of walls and alignment.
 - c. Ties: On a periodic basis, inspect ties in masonry for type, straightness, embedment, spacing and size.
 - d. 4. Dowels and Anchors: On a continuous basis inspect the installation of masonry anchor bolts, joist anchors, inserts, straps and dowels.
13. Prior to Masonry Grouting and Capping
- a. Grout Spaces: On a continuous basis, verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.
 - b. Reinforcement: On a periodic basis, verify placement of reinforcement and connectors remains consistent with Contract Documents.
 - c. Site Prepared Grout: On a periodic basis, verify proportions of site prepared grout are consistent with previously submitted materials.
14. During Grout Placement
- a. Continuously observe proper grouting technique including consolidation to approved height of grout space, cleanouts, rebar positioning, reconsolidation and vibration.
 - b. Grout Specimens: Observe 100% of preparation of all required grout specimens, mortar specimens, and/or prisms to be tested.
 - c. Dry Packing: On a periodic basis, verify proper application of dry packing.

G. STRUCTURAL STEEL, COMPOSITE STEEL DECKING, AND STEEL ROOF DECKING

1. High Strength Bolting:
 - a. Preparation: Visually inspect mating surfaces and bolt type for all slip-critical bolted connections for general conformance with the Contract Documents prior to bolting.

CODE REQUIRED SPECIAL INSPECTIONS

- b. Slip Critical Bolts and Tension Bolts: Test bolt tightening in 100% of all bolts. Verify that all plies of connected elements have been brought into contact, at 100% of connections. Verify all tips are removed from "twist"-off bolts.
 - c. Bearing Bolts: Visually inspect to confirm all plies of connected elements have been brought into contact, at 100% of connections. (Applies only to bolts designed for values not requiring exclusion of threads from failure plane, all other bolts require testing as for tension bolts.)
 - d. Standard: Test High Strength bolted connections per RCSC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts," and IBC Chapter 17.
 - e. Fabricator Certification: For shop fabricated work, perform tests required above, except that bolt testing may be reduced or deleted, if fabrication shop satisfies AISC Quality Certification Program - Conventional Steel Building Structures or more stringent criteria and has approval from building official and Engineer.
2. Welding:
- a. Fillet Welds: Visually inspect 100% of all fillet welds, for size, length and quality, per AWS D1.1.
 - b. Partial Penetration Welds: Test 100% of all partial penetration welds exceeding 5/16 inch, using Ultrasonic Testing per AWS D1.1, Section 6. Test 100% of all partial penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E 709, performed on root pass and on finished weld.
 - c. Full Penetration Welds: Test 100% of all full penetration welds exceeding 5/16 inch, using Ultrasonic Testing per AWS D1.1 Section 6. Test 100% of all full penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E 709, performed on root pass and on finished weld.
 - d. Deck Welds: Visually inspect size, location, length and burn-through for 100% of puddle welds on metal deck designed as a structural element, per AWS D1.3, Section 6.
 - e. Cold Formed Metal Framing Welds: Visually inspect 100% of welds for specified length, size and continuity in accordance with AWS D1.3 for metal less than 1/8 inch in thickness, for work designed as a structural element.
 - f. Welding of Reinforcing Bars: Visually inspect 100% of all reinforcing bar welds as the welding is performed, per AWS D1.4. Verify proper joint preparation is provided and proper electrodes are used and properly stored and dried.
 - g. Miscellaneous Metals, Inserts and Prefabricated Components: Where integrity of the connections impact life safety or performance of the building structure, provide testing and inspection as for typical welds previously specified.
 - h. Fabricator Certification: Perform tests as noted above for shop fabricated work also, except that: Fillet weld and partial penetration weld testing may be reduced or deleted, if fabrication shop satisfies AISC Quality Certification Program - Steel Building Structures, or more stringent criteria and has approval from building official and Engineer.
3. Procedures and Preparation
- a. Verify qualifications of all welders as AWS certified.
 - b. Verify proposed welding procedures and materials.
 - c. Verify adequate preparation of faying surfaces.
 - d. Verify preheat and interpass temperatures of steel, proper technique and sequence of welding, and cleaning and number of passes are provided as required.

CODE REQUIRED SPECIAL INSPECTIONS

4. Mechanical Fasteners (Misc.): Visually inspect specified size, spacing, embedment and location.
5. Submittals: Verify mill test reports and other submitted documentation, for compliance with Contract Documents.
6. Materials: Verify materials delivered to site comply with Contract Documents and approved shop drawings.
7. Detail Compatibility: On a periodic basis:
 - a. Review project documents affecting integrity of the structure, including Contract Documents and pertinent submittals (approved shop drawings).
 - b. Visit site, at intervals appropriate to the stage of construction, to perform review of the structure and visually confirm general compliance with the Contract Documents and pertinent submittals.
 - c. Inspect the following to verify member orientation, configuration, type and size comply with details indicated on the Contract Documents and approved shop drawings.

END OF SECTION 014533

SECTION 014536 – MECHANICAL, PLUMBING, AND ELECTRICAL COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Provide necessary work and services required for the complete installation of heating, ventilating, air conditioning, plumbing, and electrical systems as shown on the Drawings.
- B. Make installations in a manner that complies with applicable codes and laws. Where the requirements of Contract Documents exceed code requirements, comply with the Contract Documents.
- C. Perform electrical Work in accordance with the latest edition of the National Electrical Code as minimum standards of quality and safety.

1.2 CONTRACT DRAWINGS

- A. The Drawings are schematic in nature. Determine exact locations by field measurement, by checking the requirements of other trades, and by review of all Contract Documents.
- B. The Drawings indicate general routing of the various parts of the systems, but do not indicate all sizes, fittings, offsets, and runouts which are required. Provide correct sizes, fittings, offsets, and runouts required to fit the system into spaces allocated to them. Locate all light fixtures, vents, and supply grilles to conform to the ceiling grid system. Examine the Drawings to become familiar with all related requirements.

1.3 COORDINATION SUBMITTALS

- A. Conform to the requirements of Division 00 and 01 Sections for Submittals.
- B. Prepare and review shop drawings, product data, and samples for compliance with Contract Documents and for coordination among work of all sections of the Project Manual. Transmit to Contractor for review, then transmit to Architect.
- C. Check field dimensions and clearances and relationship to available space and anchors.
- D. Check compatibility with equipment and Work of other sections, electrical characteristics, and operational control requirements.
- E. Check motor voltages and control characteristics.
- F. Coordinate controls, interlocks, wiring of pneumatic switches, and relays.
- G. Coordinate wiring and control diagrams.

- H. Review the effect of any changes on work of other sections.
- I. Equipment and material submittals shall show sufficient data to indicate complete compliance with Contract Documents as follows:
 - 1. Proper sizes and capabilities.
 - 2. Ability to fit in the available space in a manner that will allow proper service.
 - 3. Construction methods, materials, and finishes.
 - 4. List of accessories.
- J. Product data shall include the contract item designation, building, and proposed model number.
- K. If proposed air devices are different than models specified, indicate the specified model and beside it the proposed model for each type of device.
- L. For any item to be installed in or on a finished surface (such as tee bar, acoustical ceiling, drywall wall) certify that applicable Contract Documents have been checked and that the item submitted is compatible with the surface finish on which it is to be installed.
- M. All Submittals shall be bound into three ring binders with hard plastic covers, with a table of contents listing all items in that specific submittal. Loose catalog sheets or drawings will not be acceptable. A separate submittal will be required for each type of equipment; e.g., lighting fixtures, switchgear, lighting panels, clock system, mechanical equipment, plumbing items, and ductwork accessories, each in a separate brochure. Miscellaneous apparatuses such as transformers, contactors, time switches, and safety switches may be contained in one submittal.
- N. Auxiliary system submittals shall contain sufficient information to show conformance with the specifications and shall include a description of the operation of each system to aid the consultant in the evaluation of each submittal.
- O. Verify and coordinate information recording onto the Record Documents.

1.4 COORDINATION DOCUMENTS

- A. Shop Drawings: Sheet metal, piping, mechanical, and electrical fabrication Shop Drawings shall show equipment, ductwork, and piping, including piping in plumbing chases, sized and drawn in exact location to be installed. Produce Drawings at least 1/4 inch scale with all ductwork and piping sized accordingly.
- B. Coordination Drawings:
 - 1. Coordination Drawings are Drawings which indicate relationships between the various systems and other components of the building such as beams, columns, ceilings, and walls. They shall be drawn to scale and shall include plans, elevations, sections, and other details as required to clearly define the relationships of the various components. Indicate ducts, conduits, sprinkler systems, light fixtures, piping, and miscellaneous equipment on one Drawing for each floor or level. Refer to Mechanical and Electrical Specifications for additional requirements.
 - 2. Prepare coordination drawings to organize installation of Products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.

3. Prepare a master schedule to identify responsibilities under each section of Divisions 1 through 16 of the Specifications for activities which directly relate to this work, including submittals and temporary utilities. Identify electrical power characteristics and control wiring required for each item of equipment.
4. Maintain documents for the duration of the Work, recording changes due to site instructions, modifications or adjustments.
5. After Architect review or original and revised documents, reproduce and distribute copies to concerned parties.

C. Interference Drawings:

1. Interference Drawings are supplementary to Coordination Drawings and indicate conflict between the various systems and other components of the building such as beams, columns, and walls. They shall be drawn to large scale and shall include plans, elevations, sections, and other details as required to clearly define the interference and to indicate the Contractor's proposed solution.
2. Submit Drawings for approval whenever job measurements and an analysis of the Drawings and specifications by the Contractor indicate that the various systems cannot be installed without significant deviation from the intent of the Contract. When such an interference is encountered, Work shall cease in the general areas of the conflict until a solution to the question has been approved by the Architect.

1.5 MANUFACTURER'S DIRECTIONS AND SUPERVISION

- A. Follow manufacturer's directions for installation, testing, and operation of all apparatuses and equipment provided.
- B. Where supervision by a manufacturer is required in the specification or by the manufacturer's warranty, pay all costs and follow all instructions and recommendations of the manufacturer with regards to who shall supervise the installation, connection, startup adjustment, instruction of the Owner, and final tests of equipment and systems. Where two or more manufacturer's equipment is interrelated, coordinate the Work and supervision.
- C. Provide a letter from the manufacturers whose supervision is required stating that they have supervised the installation and their equipment or system is operating satisfactorily in detail and in every respect and that the Owner's representative has been instructed in the operation and maintenance.

1.6 REQUIREMENTS FOR EQUIPMENT

- A. Provide equipment with necessary parts and accessories even though the parts and accessories are not specifically mentioned herein.
- B. Provide a factory applied finish on all exterior surfaces. Touch up or refinish items which have the finish marred, before final acceptance.
- C. Rotating parts shall be in static and dynamic balance.

- D. Electrical materials shall bear the stamp of approval of the Underwriter's Laboratory.
- E. Noise: Eliminate any abnormal noises, which are not an inherent part of the systems as designed. Abnormal buzzing and rattling of equipment, piping, ducts, and air devices and squeaks in rotating equipment components will not be acceptable.

1.7 PROTECTION OF EQUIPMENT

- A. Do not deliver equipment to jobsite until progress of construction has reached the stage where equipment is actually needed, or until equipment can be stored inside building to protect equipment from the weather. Equipment allowed to stand in weather will be rejected, and new equipment shall be required at no additional cost to the Owner.
- B. Adequately protect equipment from damage after delivery to job site. Cover with drop cloths as required to protect from plaster, dirt, paint, water, adverse weather conditions, and physical damage.
- C. Equipment which has been damaged by construction activities will be rejected, and new equipment shall be required at no additional cost to the Owner.
- D. At time of Substantial Completion, equipment shall be clean.

1.8 COORDINATION OF WORK

- A. Coordinate the mechanical and electrical Work with that of other trades in order that the various components of the systems shall be installed at the proper time, shall fit the available space, and shall allow proper service access to those requiring maintenance, including equipment specified in other Divisions.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Conduct conferences among Subcontractors and others concerned with the Work, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Participate in progress meetings. Report on progress of Work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- E. Remove and relocate items which are installed without regard to proper access as directed by the Architect, at no additional cost to the Owner.
- F. Provide materials with trim to match and fit properly with the types of adjacent ceiling, wall, and floor finishes actually installed. Model numbers in specifications or scheduled on Drawings are not intended to designate the required trim.
- G. Provide mechanical equipment with electrical characteristics compatible with that shown on Electrical Drawings and described in Electrical Division of the specifications.

- H. Prior to the fabrication of ductwork or the installation of devices in the ceilings, review the Drawings to ascertain that the locations of devices in the ceilings create a pattern which is compatible with the reflected ceiling plan and the spacings of the various ceiling mounted devices.
- I. In certain instances, the Architect may require relocation of outlets and switches. Where relocation is within 3 feet of location shown on Drawings, and when Contractor is informed of necessary relocation before Work is completed on this portion of the job, the Contractor shall comply with the relocation request at no additional cost to the Owner.

END OF SECTION 014536

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service: Contractor shall provide and pay for connections and extensions of services as required for construction operations.
- C. Electric Power Service: Contractor shall provide and pay for connections and extensions of services as required for construction operations.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: If required, arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Common-Use Field Office: To be located within the bounds of the project area, of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly.

2.2 CONSTRUCTION SITE FENCING

- A. Construction fencing around the job site must be erected before any construction work, excavation or other site preparation begins, including repair to existing infrastructure. Design of all construction fencing must meet current OSHA standards.
 - 1. Fencing is intended to prevent access from the general public to construction site areas.
 - 2. Chain linked fencing made of galvanized steel, backed with wind screens must be a minimum 72" (6 feet) high unless otherwise approved and be in accordance with OSHA requirements and local codes. Fencing will include a top and bottom rail. The wind screen is to be constructed of knitted polyethylene barrier securely fixed to the inside face of the fencing. No twisted wire is to protrude on the exterior side of the fence.
 - 3. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment:
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with minimum MERV of 8 at each return air grille in system.
- C. Lighting: Provide sufficient temporary lighting to ensure proper workmanship and safe and adequate working conditions.

2.4 SIGNAGE

- A. Provide temporary, directional and instructional signs for construction personnel and visitors seeking entrance to Project.
 - 1. Maintain, update, and touch-up signs so they are legible at all times.
- B. Project Identification Sign: Provide one project sign with graphics and lettering as required by the Owner and Architect.

TEMPORARY FACILITIES AND CONTROLS

1. The sign shall be approximately 4'-0" x 8'-0", and it shall be constructed of waterproof plywood 3/4" thick, or as otherwise approved by the Architect, and shall be mounted on a rigid, substantial frame with non-corroding wood screws, or with suitable non-corroding bolts and washers. Protect with top edge surface with an aluminum cap flashing bent down over edges and secured with aluminum nails. Paint the back and sides of the sign an approved color as selected by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TEMPORARY USE OF PERMANENT FACILITIES

- A. Water Service: Use of Owner's water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to like-new condition as existing before initial use.
 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans, in proper locations.
- B. Toilets: Use of Owner's toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to like-new condition as existing before initial use.
- C. Electric Power Service: Use of Owner's electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner, and responsibility for payment of use charges during the work is agreed upon with Owner.
- D. Elevator Use: Use of Owner's elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to like-new condition as before initial use.
 1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

TEMPORARY FACILITIES AND CONTROLS

- E. Stair Usage: Use of Owner's stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to like-new condition as existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.3 TEMPORARY UTILITY INSTALLATION

- A. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- B. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- D. Telephone Service: Provide temporary telephone service in field office for use by all construction personnel.
 - 1. At each field office, clearly post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's alternate contact phone numbers.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' offices and field representatives.
 - 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management." Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

TEMPORARY FACILITIES AND CONTROLS

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- B. Temporary Enclosures: Provide temporary enclosures for protection of construction in progress. Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and occupants from fumes and noise.
- C. Temporary Partitions:
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 - 2. Construct dustproof partitions with 2 layers of 3-mil (0.07-mm) polyethylene sheet on each side. Cover floor with 2 layers of 3-mil (0.07-mm) polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints.
 - 3. Insulate partitions to provide noise protection to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 - 5. Protect air-handling equipment.
 - 6. Weather strip openings.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in all construction areas.
 - 2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 3. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may

TEMPORARY FACILITIES AND CONTROLS

have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements.

END OF SECTION 015000

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction.
 - 2. Division 31 Sections for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 SUBMITTALS

- A. Waste Management Plan: Submit a written plan to the Architect within 30 days of date established for the Notice to Proceed.
- B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.4 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and overall target waste reduction goals.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities, including contact information for the facilities, haulers, or service providers that will handle each material being disposed.
 - 5. Review waste management requirements for each trade and major subcontractors.

1.5 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost analysis. Describe strategies planned for waste handling and recycling.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, expected quantity of each type of waste, and handling and transportation procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by the Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

CONSTRUCTION WASTE MANAGEMENT

- B. Waste Management Coordinator: Designate a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Control dust and dirt, environmental protection, and noise.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.

CONSTRUCTION WASTE MANAGEMENT

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees.
- C. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

3.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a manner acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion and Final Completion Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of each item on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include Certificates of Occupancy, operating permits, and similar releases.
 - 5. Prepare and submit Project Record Documents, as-built document when required, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.

9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Submit pest-control final report and warranty.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
16. Complete demonstration and training for Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

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

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

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Create a written list for distribution to the Owner, Designers, and all trades. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order using same room number designations as appear on the Contract Document plans.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.5 FINAL COMPLETION

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

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), signed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection, or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 WARRANTIES

- A. Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is applicable.
- B. Submit properly executed warranties within seven (7) days of Substantial Completion of designated portions of the Work that are completed and occupied or used by Owner.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind printed warranties and bonds in heavy-duty, 3-ring, vinyl-covered binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - a. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - b. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 2. Compile electronic files of warranty documents into logical file names and folders, and include a single Index or Table of Contents document with a list of all included files with a brief description of each.
 - a. Digital signatures and facsimiles of handwritten signatures and notations shall have the same force and effect as if occurring on paper documents.
- D. Include additional copies of each warranty in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

- l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts that have been subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Emergency manuals.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Sections for Submittal Procedures, Closeout Procedures, and Project Record Documents.
 - 2. Division 01 Sections for Demonstration and Training.
 - 3. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

- A. Submit all Manual documents electronically in final form at least fifteen (15) days before final inspection. Architect will return documents with comments after final inspection.
 - 1. Preferred file format is PDF; assemble each manual into logical file names and folders, and include a single Index or Table of Contents document with a list of all included files with a brief description of each.
 - 2. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within fifteen (15) days of receipt of Architect's comments.

1.4 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section or folder for each system and subsystem. Organize separate folders to group documents related to each separate product category or system type.
- B. Electronic Files: When scanning of paper documents is necessary, configure scanned files for minimum resolution and file size that allows all graphic details to be clearly readable.
- C. Title Page or Manual Cover Sheet: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of manual compilation.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the folder, volume, or media label, and cross-referenced to Specification Section number in Project Manual.
 - 1. If documentation requires more than one volume of media to accommodate data, include a comprehensive table of contents for all volumes of the set.
- E. Manual Contents: Organize into files of manageable size. Arrange contents by system, subsystem, and equipment. Assemble instructions for subsystems, equipment, and components of one system into a common folder.
 - 1. Cross-reference other media, folders or documents if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - 2. Identify each media volume with title "OPERATION AND MAINTENANCE MANUAL," for Project Title or Name, and indicate volume number for multiple-volume sets.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.

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

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.

2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, telephone number, and email address of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

OPERATION AND MAINTENANCE DATA

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, telephone number, and email address of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, mark each sheet to identify each specific product or component incorporated into the Work. If data include more than one similar item, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and cross out references to information not applicable.
 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Submit a complete set of marked-up Record Prints, in electronic format as PDFs.
 - 1. Ensure that file sizes are not too large, and that all graphics and notes are legible.
- B. Record Specifications: Submit one copy of annotated Project's Specifications, including addenda and contract modifications, in electronic format as PDFs.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data,

whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
- a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble any other miscellaneous records required by other Specification Sections for project record-keeping and submittal in connection with actual performance of the Work. Save electronic files of miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain a copy of each submittal during the construction period for Project Record Document purposes. Record and note changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Keep Record Documents and Samples in the office apart from the Contract Documents used for construction. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Owner's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the MTA Invitation to Bid documents and other Division 00 and 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Sections for Project Management and Coordination, and Project Meetings.
 - 2. Division 01 Sections for Closeout Procedures and Operations and Maintenance Data.
 - 3. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training to Owner and all relevant designers, sub-contractors, and other entities. Including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Confirm who will be in attendance via email, phonecall, or other means to ensure necessary participation.
- B. Attendance Record: For each training module, submit list of participants with names, company affiliations, and intended responsibilities.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

- B. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to accommodate Owner's personnel attendance.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Owner.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Motorized doors, including overhead coiling doors overhead and automatic entrance doors.
 - 2. Miscellaneous equipment, including projection screens, electronic locks, and other field devices.
 - 3. Fire-protection systems, including fire alarms, fire pumps and fire-extinguishing systems.
 - 4. Intrusion detection systems, if installed by Contractor.
 - 5. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping and water distribution piping.
 - 6. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
 - 7. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
 - 8. HVAC instrumentation and controls.
 - 9. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - 10. Lighting equipment and controls.
 - 11. Communication and data systems provided and installed by Contractor.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.

- b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Regulatory requirements.
 - d. Limiting operational conditions.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions.
 - d. Sequences for electric or electronic systems.
 - e. Any special instructions and procedures during emergencies.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Normal shutdown instructions.
 - h. Procedures for system, subsystem, or equipment failure.
 - i. Seasonal and/or time/day dependent operating instructions.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Noise and vibration adjustments.
 - c. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Testing procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance and ongoing routine maintenance.
 - f. Instruction on use of special tools.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Deliver an electronic copy of training materials to the Owner.
- B. Use equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed on times.
- D. Cleanup: Collect used and leftover materials and give to Owner, or remove from site. Restore systems and equipment to normal operational status.

END OF SECTION 017900

SECTION 019100 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Commissioning (Cx) is a systematic process of verifying that the building systems perform interactively according to the construction documents and the Owner's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:
1. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
 2. Verify that Operations & Maintenance documentation is complete.
 3. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
 4. Verify that the Owner's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
- B. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections may include:
1. Division 21 Sections for Fire Suppression, for commissioning process activities for fire-suppression systems, assemblies, equipment, and components.
 2. Division 22 Sections Plumbing, for commissioning process activities for plumbing systems, assemblies, equipment, and components.
 3. Division 23 Sections for HVAC, for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
 4. Division 25 Sections for Integrated Automation, for commissioning process activities for integrated automation systems, assemblies, equipment, and components.
 5. Division 26 Sections for Electrical Systems, for commissioning process activities for electrical systems, assemblies, equipment, and components.
 6. Division 27 Sections for Communications, for commissioning process activities for communications systems, assemblies, equipment, and components.

GENERAL COMMISSIONING REQUIREMENTS

7. Division 28 Sections for Electronic Safety and Security, for commissioning process activities for electronic safety and security systems, assemblies, equipment, and components.

1.3 DEFINITIONS

- A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.
- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- F. TAB: Testing, Adjusting, and Balancing. TAB is setting up the system flows and pressures as specified, while System Functional Performance Testing is verifying that the system is functioning in accordance with requirements. These are part of, but not the same as, commissioning.

1.4 REFERENCES

- A. ANSI/ASHRAE/IES Standard 202 : Commissioning Process for Buildings and Systems.
- B. ASHRAE Guideline 0-2019, The Commissioning Process
- C. ASTM E2813 : Standard Practice for Building Enclosure Commissioning.
- D. ASTM E2947 : Standard Guide for Building Enclosure Commissioning.

1.5 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Contractor:

GENERAL COMMISSIONING REQUIREMENTS

1. Individual commissioning agents, each having the authority to act on behalf of the entity he or she represents, to implement the commissioning process for particular components, equipment, or systems.

C. Members Appointed by Owner:

1. CxA: When utilized by the Owner, the designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.6 SCHEDULING

- A. Contractor shall integrate all Commissioning activities into the Baseline Schedule and the Work Progress Schedule. All parties will address scheduling problems and make necessary notifications in a timely manner to expedite all Commissioning activities.

1.7 CONTRACTOR RESPONSIBILITIES

- A. Participating Contractors shall include all costs to complete the Cx requirements in their contract price including all costs for Sub-Contractors, vendors and suppliers.
- B. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 2. Integrate and coordinate commissioning process activities with construction schedule.
 3. Complete commissioning process test procedures.
 4. Complete checklists as Work is completed.
- C. Schedule and conduct pre-installation meetings and pre-commissioning meetings with Subcontractors and equipment suppliers related to Commissioning. Contractor must invite A/E and Owner to attend the pre-installation meetings and pre-commissioning meetings.
- D. As the Project progresses, maintain specific checklists, test procedures, schedules, recorded results, action lists, signoff sheets and other documents for the Commissioning and Close-out Manuals.

1.8 COMMISSIONING ACTIVITIES

- A. Static Testing – Tests performed by the Contractor on equipment and systems that are required to complete the installation of the systems. These tests include flushing of piping systems, pressure and leak tests, water quality tests, etc.

GENERAL COMMISSIONING REQUIREMENTS

- B. Installation Verification – Inspections performed by the Contractor to verify that the building systems and equipment are physically installed in accordance with the requirements of the contract documents.
- C. Start-up Testing – Normal start-up services performed by the Contractor or Manufacturer’s Representative to bring each system into full operational state. This includes initial operational settings and calibrations of equipment and controls, alignment, lubrication, motor rotation check, etc. This includes factory start-up services for major equipment.
- D. Testing, Adjusting, and Balancing (TAB) – Testing, Adjusting, and Balancing of equipment and systems as specified in applicable Divisions.
- E. Functional Performance Tests – Tests performed to verify all components, subsystems, and systems function in accordance with the contract documents and design intent.
- F. Controls Calibration Verification – Verification of calibration of sensors, transmitters, actuators, and other control devices.
- G. Control Sequence Testing – Verification of proper programming and execution of all specified control sequences including control loops, interlocks, overrides, safeties, BAS front end functions, and scheduling. Control loop tuning shall attempt to minimize energy consumption.

1.9 COMMISSIONED SYSTEMS

- A. HVAC Systems:
 - 1. Air Handling Units
 - 2. Condensing Units
 - 3. Exhaust Fans and Supply Fans
 - 4. Variable Frequency Drives
 - 5. Motorized Intake Dampers
 - 6. Fire/Smoke Dampers
 - 7. Heating Equipment and Boilers
 - 8. Testing, Adjusting and Balancing work
 - 9. Building Automation System (controlled devices, control loops and system integration)
- B. Plumbing Systems:
 - 1. Domestic Hot Water Recirculation Pumps
 - 2. Domestic Hot Water Heaters
 - 3. Oil/Water Separators
 - 4. Pumps
 - 5. Irrigation Systems
- C. Electrical Systems:
 - 1. Lighting Controls
 - 2. Transfer Switches
 - 3. Switchboards/Panelboards
 - 4. Fire Alarm and interface with other systems
 - 5. Elevators and Conveying systems

6. Communications systems
7. On-site Power Generation and power storage

PART 2 - PRODUCTS

2.1 TESTING EQUIPMENT

- A. Subcontractors shall provide all specialized tools, test equipment and instruments required to execute startup, checkout, functional performance and integrated systems testing of equipment under their contract.
- B. Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance within tolerances specified. A testing laboratory shall use test equipment that has been calibrated within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be calibrated according to manufacturer's recommended intervals and whenever it is dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 DOCUMENTATION

- A. Deficiency Report and Resolution Record: Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Agent. In such cases the deficiency and resolution shall be documented.
- B. For identified discrepancies:
 1. If there is no dispute over the deficiency and the responsibility to correct it:
 - a. The Commissioning Agent documents the deficiency and notes the adjustments or alterations required to correct it. The Contractor corrects the deficiency and arranges for the Commissioning Agent to re-test the system.
 - b. Keep records of initial test results as well as subsequent test results.
 2. If there is a dispute about a deficiency or who is responsible:
 - a. The deficiency is documented and a copy of the form is given to the Owner and Architect/Engineer.
 - b. Contractor shall have responsibility for resolving construction-related deficiencies.
 - c. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the A/E.
 - d. If a design revision is deemed necessary and if approved by Owner, Architect/Engineer shall have responsibility for providing design revision. An RFP may then be generated for pricing the revised design, and the Owner shall have responsibility for additional material and installation costs.
 3. Cost of Retesting

GENERAL COMMISSIONING REQUIREMENTS

- a. The Contractor shall pay for additional construction or functional testing due to deficiencies for which the Contractors forces are responsible.
 - b. If the Contractor is not responsible for the deficiency, the retesting costs shall be negotiated between the responsible parties.
 - c. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- C. Commissioning Manual: Contractor shall compile and organize all Commissioning documentation into a Commissioning and Close-out Manual and deliver to the Owner as specified in Division 01 Section for Project Close-out Procedures.

END OF SECTION 019100

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.2 RELATED REQUIREMENTS

- A. Section 032000 - Concrete Reinforcing.
- B. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2017).
- D. ACI 347R - Guide to Formwork for Concrete 2014.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 - PRODUCTS

2.1 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.2 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over-stressing by construction loads.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.8 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.2 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories.
- B. Section 033000 - Cast-in-Place Concrete.
- C. Section 042000 - Unit Masonry: Reinforcement for masonry.

1.3 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2017).
- C. ACI SP-66 - ACI Detailing Manual 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
- E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2022a.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2022.
- G. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars 2018, with Amendment (2020).
- H. CRSI (DA4) - Manual of Standard Practice 2018, with Errata (2019).

- I. CRSI (P1) - Placing Reinforcing Bars, 10th Edition 2019.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.
 - 1. Maintain one copy of each document on project site.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Deformed billet-steel bars.
- B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
- C. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
- D. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.2 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

- B. Welding of reinforcement is permitted only with the specific approval of Engineer. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 - EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as indicated on structural drawings.

3.2 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete foundations.
- C. Joint devices associated with concrete work.
- D. Concrete curing.

1.2 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 032000 - Concrete Reinforcing.

1.3 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.
- C. ACI 301 - Specifications for Structural Concrete 2016.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting 2020.
- F. ACI 306R - Guide to Cold Weather Concreting 2016.
- G. ACI 308R - Guide to External Curing of Concrete 2016.

- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2017).
- I. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.
- M. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.
- N. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- O. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).
- R. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2023, with Editorial Revision.
- S. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.
- T. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2020.

- U. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.
- V. ASTM E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric) 2014.
- W. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.
- X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017 (Reapproved 2023).

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
 - 3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.

1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Comply with requirements of Section 031000.

2.2 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 032000.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type. Provide _____
manufactured by _____ .
 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class F.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Water Reducing Admixtures: ASTM C494/C494M.

2.5 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 1. Installation: Comply with ASTM E1643.

2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. Grout: Comply with ASTM C1107/C1107M.
 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.

2.6 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

2.7 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Mix Designs: See structural drawings for mix designs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

- A. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.4 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 014000, will inspect finished slabs for compliance with specified tolerances.
- B. See structural drawings for Minimum F(F) Floor Flatness and F(L) Floor Levelness values.
- C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 72 hours after slab installation; report both composite overall values and local values for each measured section.
- D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.5 CONCRETE FINISHING

3.6 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.7 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.8 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.

- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION 033000

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

- A. Product Data: For each type of product to be used.
- B. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with the following sections of ACI 301, unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
 - 6. "Lightweight Concrete."
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I
 - 2. Blended Hydraulic Cement: ASTM C 595, Type GU.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/8-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

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6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

2.5 RELATED MATERIALS

A. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301:

1. Minimum Compressive Strength: 4000 psi at 28 days.

C. Structural Lightweight Concrete Mix: ASTM C 330, proportioned to produce concrete with a minimum compressive strength of 3000 psi at 28 days and a calculated equilibrium unit weight of 110 lb/cu. ft. plus or minus 3 lb/cu. ft., as determined by ASTM C 567. Concrete slump at point of placement shall be the minimum necessary for efficient mixing, placing, and finishing.

1. Limit slump to 5 inches for troweled slabs and 4 inches for other slabs.

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2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

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

3.2 VAPOR RETARDERS

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.3 STEEL REINFORCEMENT

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

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired.
 - 1. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.5 FINISHING SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Comply with ACI 347.3R for surface finish visual aesthetic quality levels for indicated use categories. Provide CSC3 finish for concrete walls and structures exposed to view unless otherwise noted.

3.6 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than

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seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.7 FIELD QUALITY CONTROL

- A. Tests: Perform according to ACI 301.
 1. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

3.8 REPAIRS

- A. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- B. Repair materials and installation not specified above may be used, subject to Architect's approval.

END OF SECTION 033053

SECTION 033510 – CONCRETE HARDENERS AND SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and application of clear, colorless liquid concrete hardener, densifier, and sealer.
- B. Related Sections include the following:
 - 1. Division 03 Sections for Cast-In-Place Concrete

1.3 REFERENCE STANDARDS

- A. ASTM C779 – Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- B. ASTM F609 – Standard Test Method for Using a Horizontal Pull Slip Meter (HPS).
- C. ASTM C642 – Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.
- D. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- E. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's product data on characteristics, performance criteria, limitations, and installation instructions.
- B. Certification that products meet or exceed requirements for Low-Emitting VOCs.'
- C. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

- D. Warranty: Submit manufacturer warranty information and ensure that forms have been completed in the Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility - Obtain primary floor coating materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer.
- B. Installer trained and approved by manufacturer of primary material and having completed at least five projects of similar size and complexity.
- C. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Material Compatibility: Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2.2 CONCRETE HARDENER & DENSIFIER

- A. Description: Water-based, chemically reactive solution of inorganic siliceous materials to increase surface density and durability, reduce surface absorption of liquids, allow moisture vapor transmission, resist black tire marks, oil and grease, be VOC compliant, neutralize surface alkali eliminating efflorescence, and dry quickly for minimal downtime.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
 - 1. "Liqui-Hard Ultra" by W.R. Meadows
 - 2. "Ashford Formula" by Curecrete Distribution, Inc.
 - 3. "Chemisil Plus" by ChemMasters
 - 4. "ChemTec ONE" by Chemtec International

2.3 CONCRETE PENETRATING SEALER

- A. Description: Water-based blend of silane and siloxane, penetrating sealing compound for exterior concrete and masonry surfaces, designed to limit the intrusion of moisture and chlorides (salts) into the substrate and reduce scaling.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
 - 1. "Intraguard" by W.R. Meadows
 - 2. "Silencure SRT" by ChemMasters
 - 3. "Chemstop WB" by Euclid Chemical

2.4 CONCRETE FILM-FORMING SEALER

- A. Description: Water-based, clear, non-yellowing, high-solids barrier-sealing formula of acrylic polymers suitable for use over new and old concrete and on both interior and exterior surfaces. Protects concrete surfaces against salts, grease, oil, alkalies, mild acids, and detergents, and prevents dirt and stains from bonding to concrete.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
 - 1. "Deck-O-Grip WB" by W.R. Meadows
 - 2. "Safe Cure & Seal 309" by ChemMasters
 - 3. "Super Aqua-Cure VOX" by Euclid Chemical
- C. Non-Slip Additive: Finely ground polymer material for addition to the top coat of film-forming concrete sealers for slip resistance.
 - 1. "Sure-Step" by W.R. Meadows
 - 2. "Slip Stop" by ChemMasters
 - 3. "Grip Aid" by Dayton Superior

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Mask and protect any glass, aluminum, or other polished surfaces in the application area. Should the concrete sealer come into contact with these materials, rinse immediately with warm water to prevent pitting or discoloration.
- D. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers as required to produce coating systems indicated.
- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- F. Fill and repair all holes, cracks, and deteriorated areas in concrete.

3.3 APPLICATION

- A. Apply concrete densifier and chemical hardener in accordance with manufacturer's instructions.

- B. Ensure application equipment is clean and free of previously used materials.
- C. Do not dilute concrete densifier and chemical hardener. Materials are to be premixed for use according to manufacturer's instructions. Apply undiluted concrete densifier and chemical hardener by pouring, pumping or spraying per manufacturer's instructions, using equipment recommended by manufacturer.
- D. Test Area: Contractor shall treat a small area to establish physical and visual effects of application and absorption level to establish coverage rates. Coverage will be dependent upon surface texture and porosity.
- E. On new concrete, apply undiluted concrete densifier and chemical hardener as soon as concrete is firm enough to work on after final troweling.
- F. Do not allow material to puddle on the surface.
- G. Restrict foot traffic for at least 4 hours; 12 hours is preferable.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

END OF SECTION 033510

SECTION 035400 – CEMENTITIOUS FLOOR UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes: Self-leveling gypsum-based underlayment for indoor placement over existing substrates.
- B. Related Sections include the following:
 - 1. Division 03 Sections for Cast-In-Place Concrete
 - 2. Division 06 Sections for Rough Carpentry, Sheathing, and Underlayment

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation for each material and product used.
- B. Qualification Data: For Installer.
 - 1. Installation of the concrete topping product must be completed by a factory-trained applicator, using mixing equipment and tools approved by the topping manufacturer.
- C. Certification that products meet or exceed requirements for Low-Emitting VOCs.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.
- B. Store products in a clean, dry area. Protect from direct sunlight or contamination.
- C. Handle products in accordance with manufacturer's printed recommendations.

1.5 PROJECT CONDITIONS

- A. Do not install material below 50° F (10° C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation.

- B. Clean the substrate slab or floor of all dirt, dust, oil, grease, paint and water soluble material.
- C. Do not use in wet rooms or in exterior areas.
- D. Do not use on substrates that may be subject to intermittent or high residual moisture contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Proprietary products/systems: Poured flooring underlayment and topping products using a mixture of Portland cement and gypsum plaster for improved acoustical performance, fire resistance, and smoothness over other floor topping types.
- B. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
 - 1. "SuperCap SC500" by Laticrete
 - 2. "Gyp-Crete 2000" by Maxxon Corporation
 - 3. "Levelrock 2500" by USG Corporation
 - 4. "Firm-Fill 2010+" by Hacker Industries
 - 5. "Planitex SL 35" by Mapei Corporation

2.2 MATERIALS

- A. Self-Leveling Floor Underlayment:
 - 1. Compressive Strength: 2,000 psi to 3,200 psi.
 - 2. Dry Density: 110 to 120 lbs per cubic foot.
 - 3. Sound Control: Minimum Sound Transmission Class, 50 STC (45 field tested) – Section 1207.2, ASTM E90 and E336
 - 4. Impact Insulation Class: ii) Minimum Impact Insulation Class, 50 IIC (45 if field tested) – Section 1207.3, ASTM E492 and E1007
 - 5. Minimum Depth: 3/4 inch.
- B. Subfloor Primer: As recommended by gypsum underlayment manufacturer.
- C. Sand Aggregate: Sand shall meet ASTM C33 as well as specifications indicated in manufacturer's instructions.
- D. Water: Potable, free from impurities and from a domestic source.
- E. Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin.
- F. Sealer: All areas to receive glued-down finish goods shall be sealed with underlayment manufacturer's recommended sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Perform moisture test outlined in ASTM D4263. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/ per 1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours prior to underlayment installation.
- C. Wood Subfloors:
 - 1. Limit design of subfloor and framing to a minimum L/360.
 - 2. Wood should be APA rated T&G or back blocked at joints.
- D. Concrete substrate: Verify concrete has been properly cured for at least 28 days and is dry.

3.2 PREPARATION

- A. Leak Prevention: Fill cracks and voids in subfloor where leakage of slurry could occur using compressed building insulation, a compatible quick-setting patch material or caulk.
- B. Priming Subfloor: Prime substrate according to manufacturer's recommendations. Instructions and the number of coats will vary depending on the application; consult manufacturer's instructions.
- C. Protection from Weather: Installation shall not begin until the building is enclosed, including roof, windows, doors, and any other openings that may potentially allow moisture or drafts. Adjust ventilation system to prevent air movement across the surface. Protect application areas from direct sunlight.
- D. Joint Preparation:
 - 1. Moving Joints – honor all expansion and isolation joints up through the underlayment. A flexible sealing compound compatible with the topping slab may be installed at existing joints as recommended by the topping manufacturer.
 - 2. Install joint-filler strips where topping abuts vertical surfaces.

3.3 GENERAL INSTALLATION

- A. Mixing: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.
- B. Pour floor topping to recommended thickness. Immediately spread with a gauge rake and screed product to a smooth surface. Provide a continuous flow of wet material and maintain a wet edge throughout placement in any given area. Do not allow cold-joints.

- C. Note that temperature and humidity will affect each product's working time, flowability, and setting time.

3.4 PROTECTION

- A. After installation, temporary wood planking shall be placed wherever the floor underlayment may be subjected to wheeled or concentrated loads. The Contractor shall not place concentrated loads—such as pallets of material, drywall, taping compounds or any heavy items which may cause deflection—in the middle of any floor area or in hallways.
- B. The Contractor must provide and maintain correct environmental conditions to keep the building clean and dry, and protect against moisture and dust. Supply mechanical ventilation and heat if necessary to remove moisture from the area until the underlayment is fully dry.

END OF SECTION 035400

SECTION 040513 – MASONRY MORTAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes :
 - 1. Mortar and grout for use with masonry specified in other Sections.
- B. Related Sections include the following:
 - 1. Division 04 Sections for Unit Masonry and Structural Unit Masonry.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 REFERENCES (All references should be latest version published)

- A. ASTM International:
 - 1. ASTM C-91 - Standard Specification for Masonry Cement
 - 2. ASTM C-144 - Standard Specification for Aggregate for Masonry Mortar
 - 3. ASTM C-150 - Standard Specification for Portland Cement.
 - 4. ASTM C-199 - Standard Test Method for Pier Test for Refractory Mortars
 - 5. ASTM C-207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 - 6. ASTM C-270 - Standard Specification for Mortar for Unit Masonry.
 - 7. ASTM C-329 - Standard Test Method for Specific Gravity of Fired Ceramic Whiteware Materials
 - 8. ASTM C-395 - Standard Specification for Chemical-Resistant Resin Mortars
 - 9. ASTM C-404 - Standard Specification for Aggregates for Masonry Grout
 - 10. ASTM C-476 - Standard Specification for Grout for Masonry
 - 11. ASTM C-494 - Standard Specification for Chemical Admixtures for Concrete
 - 12. ASTM C-595 - Standard Specification for Blended Hydraulic Cements.
 - 13. ASTM C-780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Masonry.
 - 14. ASTM C-979 - Standard Specification for Pigments for Integrally Colored Concrete
 - 15. ASTM C-1019 - Standard Test Method for Sampling and Testing Grout for Masonry
 - 16. ASTM C-1157 - Standard Performance Specification for Hydraulic Cement.
 - 17. ASTM C-1329 - Standard Specification for Mortar Cement.

18. ASTM C-1384 - Standard Specification for Admixtures for Masonry Mortars.
19. ASTM C-1489 - Standard Specification for Lime Putty for Structural Purposes
20. ASTM C-1713 - Standard Specification for Mortars for the Repair of Historic Masonry

- B. ICBO-ES - Evaluation Report 3759: Easy Spread Plasticizer for Mortar.
- C. NCMA TR-88 - Hot & Cold Weather Masonry Construction Manual.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 1. Manufacturer's data sheets on each product to be used, including:
 2. Mixing and preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Installation methods
- B. Samples for Initial Selection: For the following:
 1. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
- C. Qualification Data: For testing agency.
- D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 1. Cementitious materials. Include brand, type, and name of manufacturer.
 2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 3. Grout mixes. Include description of type and proportions of ingredients.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports, per ASTM C-780 for mortar mixes required to comply with property specification.
 2. Include test reports, per ASTM C-1019, for grout mixes required to comply with compressive strength requirement.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

1.8 PROJECT CONDITIONS

- A. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C-150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C-207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C-150, Type I or Type III, and hydrated lime complying with ASTM C-207, Type S.
- D. Masonry Cement: ASTM C-91.
- E. Mortar Cement: ASTM C-1329.

- F. Aggregate for Mortar: ASTM C-144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C-404.
- H. Colored Mortar Pigment: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar. Mortar pigment shall conform to ASTM C-979.
1. Mineral oxide pigment shall not exceed 10% of the weight of Portland cement.
 2. Carbon black shall not exceed 2% of the weight of Portland cement.
- I. Epoxy Pointing Mortar: ASTM C-395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- J. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C-199 test; or an equivalent product acceptable to authorities having jurisdiction.
- K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C-494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- M. Water: Potable, free from deleterious amounts of acids, alkalis or organic materials.

2.2 APPLICATIONS

- A. Foundations and below grade: Recommended is Type S; alternate Type M or N.
- B. Foundations and above grade: Recommended is Type N; alternate Type S or M.
- C. Other Load-bearing Masonry: Use Type M, N, or S.
- D. Other Non-load-bearing Masonry: Use Type N or O.

2.3 CEMENT/LIME MORTAR

- A. Type M Mortar: Mix to the Property Specifications of ASTM C-270:
1. Compressive Strength: 2500 psi (17.2 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 2. Water Retention: 75 percent, minimum.
 3. Air Content: 12 percent, maximum.
 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.
- B. Type S Mortar: Mix to the Property Specifications of ASTM C-270:
1. Compressive Strength: 1800 psi (12.4 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 2. Water Retention: 75 percent, minimum.
 3. Air Content: 12 percent, maximum.
 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.
- C. Type N Mortar: Mix to the Property Specifications of ASTM C-270:
1. Compressive Strength: 750 psi (5.2 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 2. Water Retention: 75 percent, minimum.
 3. Air Content: 14 percent, maximum; except when structural reinforcement is incorporated into mortar, not more than 12 percent unless bond strength test data is submitted to justify higher air content.
 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.
- D. Masonry Mortar Mix: Factory blended hydraulic cement/lime/sand mix proportioned to produce masonry mortar complying with the property Specifications in ASTM C-270 for the specified type of masonry mortar; Quikrete Packaged Hydraulic cement/Lime Masonry Mix.
1. Portland Cement or Blended Cement: ASTM C-150 Types I, IA, II, IIA, III or IIIA.
 2. Portland Cement or Blended Cement: ASTM C-595 Types IS, IS-A, IP, IP-A, I(PM), I(PM)-A, I(SM), OR I(SM)-A.
 3. Portland Cement or Blended Cement: ASTM C-1157 Types GU, HE, MS, HS, MH, or LH.
 4. Lime: Hydrated lime, ASTM C-207 Type S.
 5. Sand: Mason's sand, ASTM C-144 .
- E. Lime Putty Mortar: Factory blended mix complying with ASTM C-1713 for historic restoration applications.
1. Available Manufacturer: Heritage Lime Putty Mortar Type O, by U.S. Heritage Group.
 2. Do not use portland cement or other hydraulic cements in locations where lime putty mortar is required for use.
 3. Color for exposed pointing mortar to be selected based upon trial samples to match each substrate type and at area of work.
 - a. Match mortar color by varying color of natural sand used in mortar mix. Natural and synthetic oxides of iron and chrome, compounded for use in mortar, may be used with prior approval of the Architect.

- b. For pre-packaged lime putty mortar, pigment is to be supplied by mortar manufacturer; addition of pigment in the field is not permitted. Use only inorganic pigments with proven record of satisfactory performance.

2.4 MASONRY CEMENT MORTAR

- A. Type M Mortar: Mix to the Property Specifications of ASTM C-270:
 - 1. Compressive Strength: 2500 psi (17.2 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 - 2. Water Retention: 75 percent, minimum.
 - 3. Air Content: Maximum 18 percent.
 - 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.

- B. Type S Mortar: Mix to the Property Specifications of ASTM C 270:
 - 1. Compressive Strength: 1800 psi (12.4 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 - 2. Water Retention: 75 percent, minimum.
 - 3. Air Content: Maximum 18 percent.
 - 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.

- C. Type N Mortar: Mix to the Property Specifications of ASTM C 27 0:
 - 1. Compressive Strength: 750 psi (5.2 MPa), minimum, at 28 days for laboratory mixed mortar with a flow of 110 plus/minus 5 percent.
 - 2. Water Retention: 75 percent, minimum.
 - 3. Air Content: Maximum 20 percent; maximum 18 percent when structural reinforcement is incorporated into mortar.
 - 4. Aggregate Ratio: No less than 2.25 and no more than 3.5 times the sum of the separate volumes of cementitious materials.

2.5 ACCESSORY MATERIALS

- A. Water: Clean and free from deleterious acids, alkalies, and organic matter.

- B. Admixtures: Complying with ASTM C-1384 or ICBO-ES Evaluation Report 3759.
 - 1. No air-entraining admixtures or material containing air-entraining admixtures shall be used in the mortar or grout.
 - 2. No calcium chloride or admixtures containing calcium chloride shall be used in the mortar or grout.

- C. Pigment

- D. Integral Waterproofer

2.6 MIXING

- A. **Mixing Procedure:** Add factory pre-blended dry materials to water in mortar mixer and mix for 3 to 5 minutes. Control batching procedure to insure proper proportions by measuring materials by volume with known volume containers.
- B. **Retempering:** Retemper mortar that has stiffened because of evaporation of water from mortar by adding water and blending as frequently as needed to restore required consistency.
 - 1. Portland cement lime sand may be retempered by adding water and remixing as required for workability.
 - 2. Do not use or retemper mortar if more than 2-1/2 hours have elapsed since the initial mixing of mortar has been completed, at which time mortar shall be discarded.
 - 3. Do not retemper lime putty mortar.

PART 3 - EXECUTION

3.1 See Division 04 Sections for Masonry Units.

3.2 REPAIRING, POINTING, AND CLEANING

- A. **Pointing:** During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- B. **In-Progress Cleaning:** Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. **Final Cleaning:** After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

END OF SECTION 040513

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Face brick and building (common) brick.
 - 2. Reinforcement, ties and anchors.
 - 3. Embedded flashing and drainage materials.
 - 4. Miscellaneous masonry accessories.
- B. Related Sections include the following:
 - 1. Division 04 Sections for Concrete Masonry Units
 - 2. Division 04 Section for Masonry Mortar
 - 3. Division 05 Sections for metal fabrications and metal framing
 - 4. Division 06 Sections for rough carpentry and wood framing
 - 5. Division 07 Section for Sheet Metal Flashing and Trim
 - 6. Division 07 Sections for Sheathing and Thermal Insulation
 - 7. Division 07 Section for Joint Sealants

1.3 REFERENCES

- A. ASTM International:
 - 1. C-216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
 - 2. C-62 Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
 - 3. E-835 Guide for Modular Coordination of Clay and Concrete Masonry Units
 - 4. C-67 Test Methods for Sampling and Testing Brick and Structural Clay Tile
 - 5. C-902 Specification for Pedestrian and Light Traffic Paving Brick
 - 6. C-1405 Standard Specification for Glazed Brick (Single Fired, Brick Units)
 - 7. C-1232 Terminology for Masonry

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Trim Units: Show sizes, profiles, and locations of each stone or cast trim unit required.
 3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
1. Exposed or Decorative concrete masonry units.
 2. Face brick, in the form of straps of four or more bricks.
 3. Special brick shapes.
 4. Make Samples using same sand and mortar ingredients to be used on Project.
 5. Stone trim.
 6. Accessories embedded in masonry.
- D. List of Materials Used in Constructing Mockups: List product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
1. Masonry units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting

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

- D. **Mock-Up Sample Panels:** Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. **Protection of Masonry:** During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. **Stain Prevention:** Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. **Cold-Weather Requirements:** Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include the following:
1. General Shale, Inc.
 2. Palmetto Brick Company
 3. Hebron Brick Company
 4. Old Carolina Brick Company
 5. Sioux City Brick, a division of Glen-Gery
 6. Ragland Clay Products, LLC
- B. Architect must review and approve physical samples of a sufficient number of units to satisfactorily demonstrate the color and range of texture and color variations to be expected among an entire lot.

2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.
- B. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions as shown on drawings.

2.3 BRICK

- A. General: Provide shapes indicated and as follows:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: ASTM C-216, Grade SW.
1. Type FBS unless otherwise indicated on drawings.
 2. Type FBX or FBA where designated by Architect for aesthetic effects.
 3. Efflorescence: Provide brick that has been tested according to ASTM C-67 and is rated "not effloresced."
 4. Size:
 - a. Nominal face dimensions of 4"x2-2/3"x8"
 - b. Other sizes as indicated on drawings
 - c. Manufactured to dimensions 3/8 inch less than nominal dimensions.
- C. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
- D. Building (Common) Brick: ASTM C-62, Grade SW.
1. Size: Match size of face brick.
 2. Application: Use where brick is indicated for concealed locations. Face brick complying with requirements for grade, compressive strength, and size indicated for building brick may be substituted for building brick.

2.4 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
- D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
- E. Adjustable Masonry-Veneer Anchors
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 - b. Adjustable anchors with two pintles, span of the adjustable portion 2 inches.

2. Where continuous insulation is provided on the outside of exterior wall sheathing, provide ties and anchors that are specially designed to accommodate the insulation thickness.
- F. Masonry Veneer Anchors at metal studs: Provide barrel-type anchor for screws, with polymer washers to seal the face of the envelope air/vapor barrier, and provide thermal break through the exterior applied insulation layer.
- G. Partition Top anchors: Specially designed to provide lateral shear resistance at the upper limit of masonry walls, permitting vertical deflection of the cover above, without transferring compressive loads to the masonry below.
- H. Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.

2.5 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
 2. Fabricate through-wall metal flashing embedded in masonry from stainless steel with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - a. Available Products:
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
 - 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 4. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 5. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch (1.0 mm) thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized-asphalt adhesive.
 - c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.

- d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.
- C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 LINTELS

- A. Precast Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.
- B. Poured Concrete Lintels: Pre-cast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete."
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- D. Concealed Masonry Lintel System: Prefabricated components consisting of support brackets mounted to framing channels, to be concealed entirely within a suspended masonry lintel, arch, or soffit.
1. Structural carbon steel, ASTM A36, then hot-dip galvanized per ASTM A123 or A153 as applicable; or Stainless steel, ASTM A276.
 2. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include the following:
 - a. B.O.S.S. A1 Brick on Soffit System by IG Masonry Support
 - b. Adjustable Concealed Lintel System by Halfen USA, Inc.
 - c. Concealed Lintel System by Hohmann & Bernard, Inc.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- B. Bond-Breaker Strips: Use to prevent 3-point adhesion in shallow caulk joints or joints where backer rod cannot be used, to ensure the correct and uniform sealant depth.
 - 1. Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
 - 2. Polyethylene or Polypropylene tape designed for use in concrete and masonry joints.
- C. Weep/Vent Products: Use one of the following, unless otherwise indicated:
 - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - 2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
 - 3. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-molded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color approved by Architect to match that of mortar.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Strips, full-depth of airspace cavity and 10 inches high, with dovetail or trapezoid shaped notches 7 inches deep to suspend mortar droppings at unequal heights allowing moisture to drain from the cavity and maintain airflow within the cavity wall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Combine units from several pallets or cubes as they are placed.
- F. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: As indicated on drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing or concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached and seismic anchors through sheathing to wall framing or to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
 3. Embed tie sections in masonry joints.
 4. Provide not less than 2 inch of air space between back of masonry veneer and face of sheathing.
 5. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 6. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 or 24 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 32 inches, around perimeter.

3.5 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
1. Extend movement joints through thickness of entire veneer assembly, for full length or height of veneer, including into parapets.
- B. Vertical Expansion Joints in Brick Veneer:
1. For brickwork without openings, space no more than 24 feet apart.
 2. For brickwork with multiple openings, consider symmetrical placement of expansion joints and reduced spacing of no more than 18 feet apart.
 3. Place additional vertical expansion joints as follows:
 - a. within 4 feet of corners
 - b. at offsets and setbacks
 - c. at wall intersections
 - d. at changes in wall height
 - e. where wall backing system changes
 - f. where support of brick veneer changes
 - g. where wall function or climatic exposure changes
- C. Provide horizontal, pressure-relieving joints beneath shelf angles supporting masonry, by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.

- D. Bond Breaks: Use building paper or flashing to separate brickwork from dissimilar materials, foundations and slabs.
- E. Expansion Joint Sealants: Comply with ASTM C-920, Class 50 (movement), Type S (single component), Grade NS (nonsag), Use M (for mortar). Consult sealant manufacturer's literature for guidance regarding use of primer and backing materials.

3.6 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.
- D. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep materials in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 12 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- C. Install reglets and nailers for flashing and other related construction where they are to be built into masonry.
- D. Install weep products to form moisture and air weep vents as follows:
 - 1. Install weeps in joints of the first course of masonry immediately above each level of embedded horizontal flashing.
 - 2. Install weeps above flashing under brick sills and masonry trims.
 - 3. Space weep holes 24 inches o.c., horizontally unless otherwise indicated.
 - 4. Install weeps within 48" of the tops of masonry veneer walls to promote air circulation.

5. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at 24" o.c. unless otherwise indicated. Use specified weep/vent products or open head joints to form vents.

3.8 FIELD QUALITY CONTROL

- A. Inspectors: Owner may engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
 2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

3.9 REPAIRING AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 4. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.

3.10 MASONRY WASTE DISPOSAL

- A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 042200 – STRUCTURAL CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 032000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
- B. Section 055000 - Metal Fabrications: Loose steel lintels.
- C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement 2022.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2022.
- F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units 2022.

STRUCTURAL CONCRETE MASONRY UNITS

- G. ASTM C91/C91M - Standard Specification for Masonry Cement 2023.
- H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.
- I. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- J. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019a, with Editorial Revision.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.
- M. ASTM C476 - Standard Specification for Grout for Masonry 2023.
- N. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry 2020.
- O. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2019a.
- P. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022, with Errata.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.

STRUCTURAL CONCRETE MASONRY UNITS

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block, as indicated.

2.2 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type S.
- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Types as scheduled in this section.
 - 2. Color: Standard gray.

STRUCTURAL CONCRETE MASONRY UNITS

2.3 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
- C. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
 - 1. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- D. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.
 - 4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

2.4 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.5 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type M.
 - 2. Exterior, loadbearing masonry: Type S.

STRUCTURAL CONCRETE MASONRY UNITS

3. Exterior, non-loadbearing masonry: Type N.
 4. Interior, loadbearing masonry: Type S.
 5. Interior, non-loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.

STRUCTURAL CONCRETE MASONRY UNITS

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.6 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
- C. Lap joint reinforcement ends minimum 6 inches.
- D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

STRUCTURAL CONCRETE MASONRY UNITS

3.7 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 2.63 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 36 inches on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 2.63 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 36 inches on center.
- C. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.8 LINTELS

- A. Install loose steel lintels over openings.

3.9 GROUTED COMPONENTS

- A. Reinforce bond beams as indicated on structural drawings.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.11 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C780.

3.13 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Clean soiled surfaces with cleaning solution.

3.14 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing members.
- B. Structural steel support members.

1.2 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual 2017.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2022.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- F. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2020.
- G. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments 2019.
- H. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry 2018.
- I. ASTM E709 - Standard Guide for Magnetic Particle Testing 2021.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

- M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172 2019.
- N. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections 2020.
- O. SSPC-SP 3 - Power Tool Cleaning 2018.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.
- E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Maintain one copy of each document on site.

- C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.
- D. Fabricator Qualifications: A qualified steel fabricator specializing in performing the work of this section with minimum 5 years of documented experience and that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- E. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience and certified by the AISC quality certification program, category CSE (or ASCE).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Angles, Plates, and Channels: ASTM A36/A36M.
- B. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M Class C.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- E. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.

- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work <>. Grind exposed welds smooth.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.4 SOURCE QUALITY CONTROL

- A. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
 1. Ultrasonic testing performed in accordance with ASTM E164.
 2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 3. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components and shear studs indicated on shop drawings.

- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- E. Do not field cut or alter structural members without approval of Engineer.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
 - 1. Ultrasonic testing performed in accordance with ASTM E164.
 - 2. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 3. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel framing and supports for countertops and casework.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Miscellaneous steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Loose Steel Lintels.
 - 5. Steel Stairs.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Metal-pan stair treads
 - 3. Metal plate components
 - 4. Paint products.
 - 5. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. 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. Welding certificates.
- D. Qualification Data: For professional engineer.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Stairs: Metal stairs shall withstand the following loads and stresses:
 - 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
- B. Structural Performance of Railings:
 - 1. Uniform load of 50 lbf/ ft. applied in any direction.
 - 2. Concentrated load of 200 lbf applied in any direction.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code--Stainless Steel."
- B. In addition to complying with all pertinent codes and regulations, comply with:
 - 1. "Specification for Design, Fabrication and Erection of Structural Steel for Building" of the American Institute of Steel Construction
 - 2. "Code for Welding in Building Construction" of the American Welding Society
 - 3. "Manual of Steel Construction", 9th Edition, for types of steel required.
- C. Conflicting requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards of these Specifications, the provisions of the more stringent shall govern.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Provide for trimming and fitting at site.
- B. Coordinate fabrication schedule with construction progress schedule to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or [with abrasive material metallically bonded to steel by a proprietary process.
- G. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- H. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- I. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
- J. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, 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. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

- F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- G. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (lead red brass) or No. C84400 (lead semired brass).
- H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- I. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
- C. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- D. Weld corners and seams continuously to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.9 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Fixed access ladders for roofs, mezzanines, loading docks, or similar applications.
4. Walk Through Ladders have 42" handrails at top.
5. Powder-coated finish; color to be selected by Architect.

B. Steel Ladders - Vertical:

1. 300 pound minimum capacity.
2. Ladder rungs: 18" wide min. x 3/4" diameter solid steel, spaced 12" apart.
3. 2-1/2" x 3/8" flat steel side rails and 7" stand off brackets.

C. Steel Ladders - Inclined:

1. 500 pound minimum capacity.
2. Ladder treads: 24" wide min., 6" min depth non-slip grate.
3. 5" min. channel stringers with steel-angle floor and top brackets.

2.10 MISCELLANEOUS STEEL TRIM

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

2.11 FINISHES, GENERAL

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

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 1. ASTM A 123/A 123M, for galvanizing steel and iron products.

2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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. Dull Satin Finish: No. 6.
- E. 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-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Anodic Finish: AA-M32-C22-A41 (Mechanical Finish: directional textured; Chemical Finish: etched, medium matte; Architectural Class I coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Provide wall brackets to attach handrails to walls. Provide brackets with 1-1/2 inch clearance from the inside face of the handrail to the finished wall surface.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055200 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fabricated metal railings, including solid bar stock, pipes, tubes, and metal infill panels.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include:
 - 1. Division 03 Sections for Cast-In-Place concrete and miscellaneous concrete.
 - 2. Division 04 Sections for Masonry, including grouting.
 - 3. Division 05 Sections for Metal Fabrications, including metal stairs and ladders.
 - 4. Division 06 Sections for wood framing, wood structure, and wood blocking.
 - 5. Division 07 Sections for exterior wall veneer and roofing materials that may need to be coordinated with railing mounting and attachment.
 - 6. Division 09 Sections for painting and finishing railings.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM E-894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings
 - 2. ASTM E-935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
 - 3. ASTM A-36 - Standard Specification for Carbon Structural Steel
 - 4. ASTM A-47 - Standard Specification for Ferritic Malleable Iron Castings
 - 5. ASTM A-48 - Standard Specification for Gray Iron Castings
 - 6. ASTM A-500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - 7. ASTM A-513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
 - 8. ASTM A-580 - Standard Specification for Stainless Steel Wire
 - 9. ASTM B-26 - Standard Specification for Aluminum-Alloy Sand Castings
 - 10. ASTM B-221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - 11. ASTM B-633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - 12. ASTM F-1267 - Standard Specification for Metal, Expanded Steel

1.4 PERFORMANCE REQUIREMENTS

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

1.5 SUBMITTALS

- A. Product Data: For mechanically connected railings, grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples: For each exposed finish required.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E-894 and ASTM E-935.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Qualifications Data:
1. For Fabricator, including welding certifications.
 2. For Installer, including welding certifications.
 3. For Professional Engineer, for loading design.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the project include, but are not limited to:
1. Sharpe Products
 2. Wagner, R & B, Inc.; a division of the Wagner Companies.
 3. HDI Railing Systems
 4. Julius Blum & Co., Inc.
 5. Livers Bronze Co.

2.2 RAILING SYSTEM

- A. Railing system shall be permanently anchored.
- B. At interior stair rails:
1. Rails and posts: round or square steel pipe metal with size of 1-1/2" max. outside diameter, Schedule 40.
 2. Pickets: 1/2-inch square or round steel tubes, spaced at 4-inches on center max.
- C. At exterior rails: see Landscape drawings for railing materials, sizes, and details.

2.3 METALS

- A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- B. Steel and Iron:
1. Tubing: ASTM A-500 (cold formed) or ASTM A-513, Type 5 (mandrel drawn).
 2. Pipe: ASTM A-53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 3. Plates, Shapes, and Bars: ASTM A-36.
 4. Castings: Either gray or malleable iron, unless otherwise indicated.
 - a. Gray Iron: ASTM A-48, Class 30, unless another class is indicated or required by structural loads.
 - b. Malleable Iron: ASTM A-47.
 5. Expanded Metal: ASTM F-1267, Type II (expanded and flattened), Class 2 or Class 3 (hot-dip zinc-coated, or corrosion-resistant).
 6. Woven-Wire Mesh: Lock-crimp weave, 2-inch square pattern, rigid galvanized mesh, made from 0.375-inch nominal diameter galvanized wire complying with ASTM A-510.
- C. Stainless Steel:
1. Pipe: ASTM A312, Grade TP 304 or Grade TP 316.
 2. Tube: ASTM A554, Grade MT 316 or Grade MT 304.

3. Castings: ASTM A743, Grade CF 8 or Grade CF 20.
4. Plate and Sheet: ASTM A240, Type 304 or Type 316L.
5. Woven-Wire Mesh: Interlock-crimp weave, 2-inch square pattern, rigid stainless steel mesh, made from 0.120-inch minimum nominal diameter wire complying with ASTM A-580, Type 304.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide concealed fasteners, unless unavoidable or standard for railings indicated.
 1. Steel Railings: Plated steel fasteners complying with ASTM B-633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Anchors: Provide cast-in-place or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E-488.
 1. Coordinate anchorage devices with supporting structures and materials.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded. Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- D. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
- F. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
- G. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer compatible with finish paint systems indicated, and complying with SSPC-Paint 5.
- H. Grout and Anchoring Cement: Factory-packaged, nonshrink, nonmetallic grout complying with ASTM C 1107; or water-resistant, nonshrink anchoring cement; recommended by manufacturer for exterior use.

2.5 FABRICATION

- A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.
- B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
- C. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.

- D. Form changes in direction by bending.
- E. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
- I. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into metal channel frames.

2.6 FINISHES

A. Steel and Iron Finishes:

1. Galvanized Railings: Hot-dip galvanize exterior railings, after fabrication, to comply with ASTM A 123/A 123M. Provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
2. Shop-Primed Galvanized Railings: After galvanizing, clean railings, treat with metallic-phosphate process, and apply primer to comply with SSPC-PA 1.
3. Shop-Primed Steel Finish: Prepare to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" and apply primer to comply with SSPC-PA 1.
4. See Division 09 Sections for field-painting steel railings and components.

B. Stainless Steel Finishes:

1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
3. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
4. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
5. Directional Satin Finish: No. 4.
6. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine assemblies and substrates where railings are to be anchored, to verify that locations of any concealed reinforcements have been clearly marked for Installer.

- B. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.
 - 1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Set posts in concrete by inserting into preset steel pipe sleeves or core-drilled holes not less than 5" deep and 1" diameter larger than the outside diameter of the post, and then solid grouting annular space.
- D. Anchor posts to metal surfaces with flanges. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- E. Attach handrails to wall with wall brackets.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. For wood stud partitions, use hanger or lag bolts set into wood backing between studs.
 - 3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs.
 - 4. For steel-framed partitions, fasten to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
 - 5. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.
- F. Welded Connections: Use fully welded joints for permanently connecting railing components.

3.2 METAL INTERACTIONS

- A. When components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with a heavy coat of a proper primer.
- B. When components come into contact with cement or lime mortar, exposed metal surfaces shall be painted with water-white methacrylate lacquer or zinc chromate.

3.3 ADJUSTING AND CLEANING

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
 - 1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- B. Protect finishes of railings from damage during construction period with temporary protective coverings as approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Exposed timber structural framing.
- C. Nonstructural dimension lumber framing.
- D. Rough opening framing for doors, windows, and roof openings.
- E. Sheathing.
- F. Subflooring.
- G. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 051200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
- C. Section 061323 - Heavy Timber Framing.
- D. Section 061753 - Shop-Fabricated Wood Trusses.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2015, with Editorial Revision (2016).

- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).
- D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2019a.
- E. PS 2 - Performance Standard for Wood Structural Panels 2018.
- F. PS 20 - American Softwood Lumber Standard 2021.
- G. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2019.
- H. SPIB (GR) - Standard Grading Rules 2021.
- I. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- J. WWPA G-5 - Western Lumber Grading Rules 2021.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: <>As indicated on structural drawings.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.

- C. Stud Framing (2 by 2 through 2 by 6):
 - 1. Species: Spruce-Pine-Fir.
 - 2. Grade: No.1/No.2.
- D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1. Species: Southern Pine.
 - 2. Grade: No. 1.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.3 EXPOSED DIMENSION LUMBER

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Sizes: Nominal sizes as indicated on drawings.
- C. Surfacing: S4S.
- D. Moisture Content: S-dry or MC19.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1. Species: Southern Pine.
 - 2. Grade: No. 1.

2.4 TIMBERS FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: Kiln-dry (20 percent maximum).
- C. Beams and Posts 5 inches and over in thickness:
 - 1. Species: Douglas Fir.
 - 2. Grade: No. 1.

2.5 EXPOSED TIMBERS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

- B. Moisture Content: Kiln-dry (20 percent maximum).
- C. Surfacing: per Architect.
- D. Species: Douglas Fir.
- E. Grade: No. 1.

2.6 STRUCTURAL COMPOSITE LUMBER

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.7 CONSTRUCTION PANELS

- A. Subflooring: Any PS 1 OR PS 2 type, rated Sheathing.
 - 1. Bond Classification: Exposure 1.
 - 2. Span Rating: 24" OC.
 - 3. Performance Category: 23/32 PERF CAT.
 - 4. Tongue and groove edges.
- B. Roof Sheathing: Any PS 1 OR PS 2 type, rated Sheathing.
 - 1. Bond Classification: Exposure 1.
 - 2. Span Rating: 40/20.
 - 3. Performance Category: 19/32 PERF CAT.
- C. Wall Sheathing: Any PS 1 OR PS 2 type.
 - 1. Bond Classification: Exposure 1.
 - 2. Grade: Sheathing.
 - 3. Span Rating: 24/16 inch.
 - 4. Performance Category: 7/16 PERF CAT.
 - 5. Edge Profile: Square edge.

2.8 ACCESSORIES

- A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.3 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.5 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.6 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring: Nail to framing; staples are not permitted.
- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Nail panels to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

3.7 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.8 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.

END OF SECTION 061000

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Wood furring.
 - 5. Wood sleepers.
 - 6. Plywood backing panels.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. APA: The Engineered Wood Association (formerly American Plywood Association).
 - 3. NHLA: National Hardwood Lumber Association.
 - 4. NLGA: National Lumber Grades Authority.
 - 5. SPIB: The Southern Pine Inspection Bureau.
 - 6. WCLIB: West Coast Lumber Inspection Bureau.
 - 7. WWPA: Western Wood Products Association.
- C. Fire Retardant Treated Wood: any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E-84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

MISCELLANEOUS ROUGH CARPENTRY

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with the applicable building code:
1. Preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.

MISCELLANEOUS ROUGH CARPENTRY

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Use Exterior type unless otherwise indicated.
 3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Framing for raised platforms.
 2. Concealed blocking.
 3. Roof construction.
 4. Plywood backing panels.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. 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.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Application: Treat items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

MISCELLANEOUS ROUGH CARPENTRY

4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness.
- B. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade.
- C. Other Framing: Construction or No. 2 grade.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.7 FASTENERS

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

MISCELLANEOUS ROUGH CARPENTRY

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M, or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
 1. Simpson Strong-Tie Co., Inc.
 2. Cleveland Steel Specialty Co.
 3. Harlen Metal Products, Inc.
 4. KC Metals Products, Inc.
 5. Southeastern Metals Manufacturing Co., Inc.
 6. USP Structural Connectors.
- B. Galvanized Steel: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 1. Use for interior locations where stainless steel is not indicated.
- C. Stainless-Steel: ASTM A 666, Type 304.
 1. Use for exterior locations and where indicated.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports, unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal-thickness.
 - 2. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- G. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
 - 4. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.
- I. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members.

MISCELLANEOUS ROUGH CARPENTRY

Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 PROTECTION

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

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring and Underlayment.
4. Sheathing joint-and-penetration treatment.
5. Flexible flashing at openings in sheathing.

- B. Related Sections may include:

1. Division 05 Sections for Metal Framing
2. Division 06 Section for Rough Carpentry
3. Division 07 Section for Weather Barriers
4. Division 07 Sections for Insulation
5. Division 07 Sections for various exterior veneer and siding types
6. Division 07 Sections for Roofing

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 6. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. For Water-Resistant Barrier / Air-Barrier Sheathing Systems: Product Data for each type of assembly component, including sheathing, joint treatments, sealants, and flashings. Include the following:
1. Construction and application details with dimensions.
 2. Manufacturer's written instructions for installation and finishing applicable to Project, including details for joints, counterflashings, penetrations, terminations, and tie-ins to adjacent construction.
 3. Framing and substrate preparation instructions and recommendations.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation.
1. Do not set panel stacks directly on the ground. Provide supports under stacks that will keep them away from ground moisture but maintain flatness.
 2. Cover panels loosely with waterproof protective material.
 3. Secure covers on top of stack, but loosely on sides and bottom to assure adequate air circulation.

PART 2 - PRODUCTS

2.1 SHEATHING, GENERAL

- A. Wood Wall Sheathing: Exterior, Exposure 1 sheathing as indicated.
1. Span Rating: Not less than 24/16
 2. Thickness: not less than 7/16", or as indicated on plans.
- B. Wood Roof Sheathing: Exterior, Exposure 1 sheathing as indicated.
1. Span Rating: Not less than 40/20.
 2. Nominal Thickness:

- a. At flat roofs: Not less than 23/32"
 - b. At pitched roofs: Not less than 19/32"
- C. Non-Structural Gypsum-Based Sheathing: Non-combustible fiberglass mat gypsum board, treated for water resistance and low moisture absorbance, with fiberglass coatings both sides.
- 1. Highest mold resistance rating of 10 per ASTM D3273.
 - 2. Zero flame spread and zero smoke developed index per ASTM E84.
 - 3. Type X where indicated for use in UL fire resistant design assemblies.

2.2 WOOD PANEL PRODUCTS, GENERAL

- A. Factory mark panels to indicate compliance with applicable standard.
- B. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- C. Oriented Strand Board: DOC PS 2.

2.3 PRESERVATIVE-TREATED WOOD

- A. Preservative Treatment by Pressure Process: AWPA C9.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED WOOD

- A. General: Comply with performance requirements in AWPA C27.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
 - 4. Use Interior Type A, unless otherwise indicated.
- B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Always treat the following:

1. Wall sheathing within 48 inches of fire walls.
2. Roof sheathing.
3. Subflooring and underlayment for raised platforms.

2.5 GLASS MAT GYPSUM SHEATHING BOARDS

- A. Fiberglass-mat faced, moisture and mold resistant gypsum sheathing panels, Non-Rated:
1. Type and Thickness: Regular, 1/2 inch or 5/8 inch as indicated by assembly.
 2. Size: 48 x 96 inches min.
 3. Reference ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 4. Product: Subject to compliance with requirements, provide one of the following:
 - a. "DensGlass Sheathing" by Georgia Pacific Building Products
 - b. "GlasRoc Sheathing" by CertainTeed.
 - c. "Securock" by United States Gypsum Company
- B. Glass-Mat Gypsum Sheathing for Fire-Resistance Rated applications:
1. Type and Thickness: Type X, 5/8 inch thick
 2. Size: 48 x 96 inches min.
 3. Reference ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 4. Product: Subject to compliance with requirements, provide one of the following:
 - a. "DensGlass Fireguard" by Georgia Pacific Building Products
 - b. "GlasRoc Sheathing Type X" by CertainTeed.
 - c. "Securock Firecode-X" by United States Gypsum Company

2.6 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, Structural I, C-C Plugged or Exposure 1, Structural I, Underlayment single-floor panels.
1. Span Rating: Not less than 24" o.c.
 2. Nominal Thickness: Not less than 23/32 inch.
 3. Edge Detail: Tongue and groove.
 4. Surface Finish: Fully sanded face.
- B. Plywood Subflooring: Exterior, Structural I or Exposure 1, Structural I single-floor panels or sheathing.
1. Span Rating: Not less than 24 o.c. or 48/24.
 2. Nominal Thickness: Not less than 23/32 inch.
- C. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.

- D. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exposure 1 Underlayment with fully sanded face.
- E. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch nominal thickness.
- F. Plywood Underlayment for Carpet: DOC PS 1, Interior Underlayment.
- G. Hardboard Underlayment: AHA A135.4, Class 4 (Service), Surface S1S; with back side sanded.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached.
 - 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.
- G. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing board to be attached. Provide washers or plates if recommended by sheathing manufacturer.

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
- B. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flashing: Per requirements of Division 7 Sections for sheet metal and/or flexible flashing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated in applicable building codes.
- D. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Subfloor-Underlayment, Subflooring, and Wall and Roof Sheathing:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
 - 2. Underlayment:
 - a. Nail or staple to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.
 - c. Fill and sand edge joints of underlayment before installing flooring.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with nails or screws approved by the sheathing manufacturer.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws approved for shear resistance criteria.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
- E. Apply water-resistive air/vapor barrier coating over sheathing boards, joints, and fastener heads as required per envelope design, indicated in Division 07 Sections.

3.4 FIBERBOARD SHEATHING INSTALLATION

- A. Comply with ASTM C 846 and with manufacturer's written instructions.
- B. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails, and comply with manufacturer's recommended spacing and referenced

fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.

- C. Install sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints if any.
- D. Cover sheathing as soon as practical after installation to prevent deterioration from wetting.

3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated wood trusses for roof and floor framing.
- B. Bridging, bracing, and anchorage.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2015, with Editorial Revision (2016).
- B. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2019.
- C. SPIB (GR) - Standard Grading Rules 2021.
- D. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction 2014.
- E. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses 2018.
- F. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses 1989.
- G. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- H. WWPA G-5 - Western Lumber Grading Rules 2021.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

SHOP-FABRICATED WOOD TRUSSES

B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.

1. Include identification of engineering software used for design.
2. Provide shop drawings and design calculations stamped or sealed by design engineer.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

PART 2 - PRODUCTS

2.1 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated on structural drawings.

1. Connectors: Steel plate.
2. Structural Design: Comply with applicable code for structural loading criteria.
3. Floor Deflection: 480 of span live load deflection, maximum. 1/360 of span total load deflection, maximum.
4. Roof Deflection: 1/240 of span live load deflection, maximum. 1/180 of span total load deflection, maximum.

2.2 MATERIALS

A. Lumber:

1. Moisture Content: Between 7 and 9 percent.

- 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.3 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 061000.
- B. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.2 PREPARATION

- A. Coordinate placement of bearing items.

3.3 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
- B. Set 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 Engineer.
- E. Install permanent bridging and bracing.

- F. Install headers and supports to frame openings required.
- G. Frame openings between trusses with lumber in accordance with Section 061000.
- H. Coordinate placement of decking with work of this section.

3.4 TOLERANCES

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

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Wood Paneling
 - 3. Shelving.
- B. Related Sections include the following:
 - 1. Division 06 Sections for Interior Architectural Woodwork and casework.
 - 2. Division 06 Sections for Rough Carpentry and Miscellaneous Rough Carpentry.
 - 3. Division 09 Section "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.
- B. MDF: Medium-density fiberboard.
- C. MDO Plywood: Plywood with a medium-density overlay on the face.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: AHA A135.4.
- D. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
- E. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.
- F. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Color: White.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Lumber: AWPA C2 or AWPA C31 (treated with inorganic boron). Kiln dry after treatment to a maximum moisture content of 19 percent.
- B. Plywood: AWPA C9. Kiln dry after treatment to a maximum moisture content of 18 percent.
- C. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- D. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
- E. Do not use material that is warped or does not comply with requirements for untreated material.
- F. Mark lumber with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- G. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - 1. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Lumber: Comply with performance requirements in AWPA C20, Interior Type A. Kiln dry after treatment to a maximum moisture content of 19 percent.
- B. Plywood: Comply with performance requirements in AWPA C27, Interior Type A. Kiln dry after treatment to a maximum moisture content of 15 percent.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants and provide materials that do not have marks from spacer sticks on the exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

2.4 STANDING AND RUNNING TRIM

- A. Wood Species and Cut: Match species and cut indicated for other types of finished architectural woodwork located in same area of building, unless otherwise indicated.
 - 1. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- B. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Eastern white pine, Premium Grade; NeLMA or NLGA.
 - 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 - 3. Face Surface: Surfaced (smooth)
- C. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Red oak, Premium Grade, NHLA.
 - 2. Maximum Moisture Content: 12 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Not allowed.
 - 5. Veneered Material: Not allowed.
 - 6. Face Surface: Surfaced (smooth).
 - 7. Matching: Selected for compatible grain and color.
- D. Lumber Trim for Opaque Finish (Painted):
 - 1. Species and Grade: Eastern white pine, Finish or Custom Grade, NeLMA or NLGA.
 - 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 - 3. Finger Jointing: Not allowed.
 - 4. Face Surface: Surfaced (smooth).
- E. Primed MDF Trim for Opaque Finish:
 - 1. Premium Grade moulded profiles as selected by Architect for baseboards, casings, crowns chair rails, etc.
 - 2. Face Surface: Surfaced smooth.
 - 3. Thicknesses, sizes, and shapes as indicated on drawings.
 - 4. Coated with a high quality water based acrylic latex primer compatible with any high quality water, oil, or lacquer based finish paint.
- F. For trim items wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- G. 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.
- H. Assemble casings in plant except where limitations of access to place of installation require field assembly.

- I. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.5 FLUSH WOOD PANELING

- A. Wood Species and Cut: White oak, quarter sawn, unless otherwise indicated.
 1. Grade: Premium.
 2. Matching of Adjacent Veneer Leaves: Slip match.
 3. Matching within Panel Face: Balance match.
 4. Matching of Adjacent Veneer Leaves and within Panel Face: Slip, center, book match.
 5. Panel-Matching Method: Made-to-order, sequence-matched panels within each separate area.
 6. Vertical Panel-Matching Method: Panel end book match; panels are book matched from lower panels to upper panels.
 7. Thickness: 3/4 inch unless otherwise noted on drawings.
 8. Exposed Panel Edges: Inset solid-wood or wood-veneer matching faces.
 9. Assemble panels by gluing and concealed fastening – fasteners shall not be visible in finished work.

2.6 SHELVING

- A. Exposed, Closet or Utility Shelving: Made from one of the following materials, 3/4 inch thick. Do not use particleboard or MDF that contains urea formaldehyde.
 1. Particleboard with solid-wood front edge.
 2. MDF with solid-wood front edge.
 3. MDO softwood plywood with solid-wood edge.
 4. Melamine-faced particleboard with radiused and filled front edge.
- B. Shelf Cleats: 3/4-by-3-1/2-inch boards (with hole and notch to receive clothes rods where indicated), of same species and grade indicated above for interior lumber trim for opaque finish.
- C. Shelf Brackets: BHMA A156.16, B04041; prime-painted formed steel with provision to support clothes rod where rod is indicated.
- D. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat finished steel.
- E. Adjustable Shelf Brackets: BHMA A156.9, B04112; powder-coat finished steel or natural aluminum.
- F. Clothes Rods: 1-1/4-inch-diameter, chrome-plated steel or stainless-steel tubes.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 1. Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 1. Interior standing and running trim except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 3. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 SHELVING INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c. Use 2 fasteners at each framing member or fastener location for cleats 3-1/2" in width and wider.
 - 1. Apply a bead of multipurpose construction adhesive to back of shelf cleats right before installing. Remove adhesive that is squeezed out immediately after fastening shelf cleats in place.
- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

- D. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- E. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- F. Cut shelves to neatly fit openings with less than ¼" gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
 - 1. Fasten shelves to cleats with finish nails or trim screws, set flush.
 - 2. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- G. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 064023 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood cabinets.
 - 2. Plastic-laminate cabinets.
 - 3. Plastic-laminate countertops.
 - 4. Shop finishing of interior woodwork.
- B. Related Sections include the following:
 - 1. Division 06 Sections for countertop materials.
 - 2. Division 06 Section "Miscellaneous Rough Carpentry" for blocking, furring, and similar items not specified in this Section.

1.3 REFERENCES

- A. American Laminator's Association (ALA)
- B. American National Standards Institute (ANSI)
 - 1. A208.1 Wood Particleboard
 - 2. A208.2 Medium Density Fiberboard for Interior Use
 - 3. A135.4 Basic Hardboard
 - 4. A161.2 Performance Standards for Fabricated High Pressure Decorative Laminate Countertops
- C. American Society of Mechanical Engineers (ASME)
 - 1. B18.6.1 Wood Screws (Inch Series)
- D. American Society of Testing and Materials (ASTM)
 - 1. D 523 Test Method for Specular Gloss
- E. Architectural Woodwork Institute (AWI)
 - 1. AWI Quality Standards 6th Edition Version 1.1
 - 2. Section 400 "Architectural Cabinets"
 - 3. Section 1500 "Factory Finishing"

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- F. Builders Hardware Manufacturers Association (BMHA)
 - 1. A156.9 Cabinet Hardware
 - 2. A156.18 Materials and Finishes
- G. Federal Specification (FS)
 - 1. FF-N-105 Nails, Brads, Staples, and Spikes: Wire, Cut and Wrought
- H. National Institute of Standards and Technology (NIST)
 - 1. PS 1 "Construction and Industrial Plywood"
 - 2. PS 20 "American Softwood Lumber Standard"
 - 3. PS 51 "Hardwood and Decorative Plywood"
 - 4. PS 58 "Basic Hardboard"
- I. H.Hardwood Plywood and Veneer Association (HPVA)
 - 1. HP 1 Interim Voluntary Standard for Hardwood and Decorative Plywood
- J. I. National Electrical Manufacturers Association (NEMA)
 - 1. LD 3 High-Pressure Decorative Laminates
- K. National Particleboard Association (NPA)
- L. Voluntary Standard for Formaldehyde Emission from Medium Density Fiberboard (MDF)

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- 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.
 - 3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- C. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. Shop-applied opaque finishes.
 - 3. Plastic laminates.
- D. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with non-factory-applied finish, 8x8 inch samples for each.

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2. Veneer-faced panel products for transparent finish, 8x8 inch samples for each species and cut. Include at least one face-veneer seam.
3. Lumber and panel products with shop-applied opaque finish, 8x8 inch samples for each finish system and color.
4. Plastic laminates, 8x8 inch samples for each type, color, pattern, and surface finish with specified edge material applied to 1 edge.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers, wood doors with face veneers that are sequence matched with woodwork, and transparent-finished wood doors that are required to be of same species as woodwork.
- B. 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 shall apply and by reference are hereby made a part of these Contract Documents.
- C. 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.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 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

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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.
- B. Hardware Coordination: Distribute copies of approved hardware templates to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's and WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: Plain-sliced red oak or cherry.
- C. Wood Species for Opaque Finish: Plain-sliced white pine, white maple, white oak, or birch.
- D. Wood Products: Comply with the following:
 1. Hardboard: AHA A135.4. All hardwoods shall be thoroughly air-dried, and then kiln dried to a moisture content of 9 percent maximum before use.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 3. Particleboard: ANSI A208.1, Grade M-2.
 4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

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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. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
 2. Interior Type A: Low-hygroscopic formulation.
 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
 4. 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.
 5. 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: 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: 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.
- 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.

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2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Butt Hinges: 2-3/4-inch 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
 - 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening.
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071
- G. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- H. 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. Box Drawer Slides: Grade 1; for drawers not more than 6 inches high and 24 inches wide.
 - 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Grommets for Cable Passage through Countertops: 2-inch OD, black molded-plastic grommets and matching plastic caps with slot for wire passage.
- L. 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.
 - 2. Satin Stainless Steel: BHMA 630.
- M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

INTERIOR ARCHITECTURAL WOODWORK

2.4 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium.
- B. AWI Type of Cabinet Construction: Flush overlay
- C. Materials, General:
 - 1. Particleboard: ANSI A208.1, Mat-Formed Particle Board, Grade 1-M-2, with minimum density of 45 pcf. Internal bond of 60 psi, and minimum screw holding capacity of 225 lb. on faces and 200 lb. on edges.
 - 2. Hardboard: Tempered, ANSI 135.4.
 - 3. Facing: 80 gram melamine resistant to water and typical cleaners.
- D. 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 VGS.
 - 4. Edges: Grade HGS
- E. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
 - 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: 3/8" thick particleboard or hardboard.
 - 3. Drawer Bottoms: 1/2" thick hardwood plywood.
- F. Concealed Surfaces: Sound and dry solid wood, plywood, or particleboard without defects affecting strength, utility, or stability.
- G. Sides, Dividers, Tops, Bottoms, Shelves, and Stretchers: Plastic laminate GP 50 (0.50 inch nominal thickness) on 3/4 inch thick particleboard. Provide stretchers for top of base cabinet.
- H. Non-Weight-Bearing Back Panels: 1/8 inch thick hardboard with thermoset decorative panels on interior surfaces, fastened to rear edge of end panels and to top and bottom rails.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated on drawings.
- J. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- K. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- L. Toe Board: 5/8 inch thick particleboard attached to subbase with concealed fasteners.

INTERIOR ARCHITECTURAL WOODWORK

2.5 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Premium.
- 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 architect's selection.
- D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- E. Core Material: Particleboard or medium-density fiberboard.
- F. Core Material at Sinks: exterior-grade plywood.
- G. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.
- H. Paper Backing: Provide paper backing on underside of countertop substrate.

2.6 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-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.
- 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
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 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. 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

INTERIOR ARCHITECTURAL WOODWORK

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.

2.7 SHOP FINISHING

- A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- C. Opaque Finish: minimum two coats catalyzed conversion varnish.
 - 1. Color: As selected by Architect from manufacturer's full range.

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 backpriming.

3.2 INSTALLATION

- A. 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.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims.

INTERIOR ARCHITECTURAL WOODWORK

- C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. 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.
- E. 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 36 inches long, except where shorter single-length pieces are necessary.
 - 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.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- G. 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. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- H. Fasteners:
 - 1. Use purpose-designed fixture attachments at concealed locations for wall-mounted components.
 - 2. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
 - 3. Countersink anchorage devices at exposed locations used to wall-mount components, and conceal with solid plugs of species to match surrounding wood. Finish flush with surrounding surfaces.
- I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

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.

INTERIOR ARCHITECTURAL WOODWORK

- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 066100 – SOLID SURFACING FABRICATIONS

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 horizontal and trim solid surface product types:

1. Countertops and Vanities with sinks
2. Tabletops
3. Windowsills
4. Backsplashes

- B. Related Sections include the following:

1. Division 6 Sections for rough carpentry for blocking.
2. Division 6 Section “Interior Architectural Woodwork” for casework.
3. Division 09 Sections for other finish materials.
4. Division 10 Sections for toilet partitions and restroom accessories.
5. Division 22 Section for Plumbing Fixtures.

1.3 REFERENCES

- A. Applicable Standards as referenced herein:

1. ANSI/NEMA LD-3: Standard for High-Pressure Decorative Laminates
2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants
3. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
4. ASTM D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
6. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
7. ASTM E228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer

1.4 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
 - 1. Coordination drawings shall be prepared indicating:
 - a. Coordinating Plumbing work.
 - b. Coordinating Electrical work.
 - c. Miscellaneous steel for the solid-surface installation.
 - d. Indicate location of all adjacent walls (rated and non-rated), blocking locations and recessed wall items, etc.
 - 2. Content: Project-specific information, drawn accurately to scale.
 - 3. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
 - 4. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
 - a. Minor dimension changes and difficult installations will not be considered changes to the contract.
- B. Samples: Submit minimum three (3) of each color, texture, or pattern indicated, 4" x 4" minimum size samples.
- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.5 QUALITY ASSURANCE

- A. Allowable tolerances:
 - 1. Variation in component size: 1/16" max..
 - 2. Location of openings: 1/8" from indicated location.
- B. Installer Qualifications: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Store in racks in a near vertical position. Prevent warpage and breakage. Store inside away from direct exposure to sunlight.

- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive quartz fabrications by field measurements before fabrication and indicate measurements on shop drawings.

1.8 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Wilsonart Solid Surface
 2. "Corian" by DuPont
 3. "Hi-Macs" by LX Hausys
 4. "Avonite" by Aristech Acrylics, Trinseo
- B. Color, pattern, and finish to be selected by Architect from manufacturer's full range.

2.2 MATERIALS

- A. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer
- B. Superficial damage to a depth of 0.010" shall be repairable by sanding and polishing.
- C. Material shall have the following minimum physical and performance properties:
 1. Tensile Strength: 5,000 psi min, per ASTM D-638
 2. Flexural Strength: 7,000 psi min, per ASTM D-790
 3. Hardness: 85 minimum on Rockwell 'M' scale per ASTM D-785
 4. Hardness: 65 minimum on Barcol scale per ASTM D-2583
 5. Thermal Expansion: 2.2×10^{-5} in./in./°F max. per ASTM E-228
 6. Flexural Modulus: 1.2×10^6 psi min per ASTM D-790
 7. Light Resistance, Cleanability/Stain Resistance, Boiling Water Resistance, High-Temperature Resistance, Radiant Heat Resistance, Abrasion Resistance and Scratch Resistance per NEMA LD-3: Passes

8. Flammability: Class A, Flame Spread and Smoke Develop Indexes less than 25 per ASTM E-84.

- D. Exposed Surface Finish: Matte, Semi-Gloss, or Polished, per Architect's selection.

2.3 ACCESSORY PRODUCTS

- A. Joint and panel adhesives: Manufacturer's recommended two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.
- B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching or clear formulations.
- C. Insulating and heat-reflecting tape: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat sources.

2.4 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2-inch wide reinforcing strip of solid polymer material under each joint.
- D. Provide holes and cutouts for plumbing and bath accessories.
- E. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Thermoforming where required:
 1. Comply with manufacturer's data.
 2. Form pieces to shape prior to seaming and joining.
 3. Cut pieces to finished dimensions.
 4. Sand edges and remove nicks and scratches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- B. Provide product in the largest pieces available to minimize seams.
- C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - 1. Exposed joints/seams shall not be allowed.
 - 2. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
- D. Cut and finish component edges with clean, sharp returns.
 - 1. Rout radii and contours to template.
- E. Anchor securely to base cabinets or other supports.
- F. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 - 1. Seal between wall and components with joint sealant recommended by manufacturer for application purpose.
- G. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- H. Install components plumb, level, rigid, scribed to adjacent finishes
 - 1. Install countertops with no more than 1/16-inch sag, bow or other variation from a straight line.
- I. Coved backsplashes and applied sidesplashes:
 - 1. Provide coved backsplashes and sidesplashes at all walls and adjacent millwork.
 - 2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.
- J. Color inlays:
 - 1. Comply with product data from manufacturer.
 - 2. Rout groove for inlay to straight edge or pattern indicated on drawings.
 - 3. Fill groove using material furnished by manufacturer.
 - 4. Cure inlay, finish and touch up to uniform appearance.
- K. Integral sinks/vanities:
 - 1. Provide solid surface materials bowls and/or lavatories sinks with overflows in locations shown on the drawings.
 - 2. Secure sinks and lavatory bowls to tops using manufacturer's recommended sealant, adhesive and mounting hardware to maintain warranty.
- L. Installation of Window Stools
 - 1. Install window stools full length of window, set securely into place using only concealed fasteners and manufacturer's approved adhesive.

2. Window stools shall be plumb, true and level.
3. Provide 1/8" expansion gaps on both sides of window stools, sealed with Manufacturer's approved sealant.
4. Ease edges and sand smooth.

3.3 PROTECTION

- A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged components that cannot be repaired to Architect's satisfaction.
- B. Clean surfaces in accordance with manufacturer's instructions, and provide protective coverings to prevent physical damage or staining following installation.
- C. Fabricator/Installer is to provide commercial care and maintenance instructions, and review maintenance procedures and warranty details with the director of maintenance upon completion of project.

END OF SECTION 066100

SECTION 066119 – QUARTZ SURFACE FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes quartz surfacing for (includes, but not limited to):
 - 1. Countertops and Vanity tops
 - 2. Tabletops and Bar tops
- B. Related Sections include the following:
 - 1. Division 05 Sections for related Metal Fabrications, trims, and edges
 - 2. Division 06 Sections for Rough Carpentry for blocking.
 - 3. Division 07 for Joint Sealants.
 - 4. Division 22 for coordination with Plumbing Fixtures.
 - 5. Division 26 for coordination with Wiring and Electrical items.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
 - 2. A118.4 - Latex-Portland Cement Mortar
 - 3. Z124.6 - Stain Resistance
- B. ASTM International (ASTM):
 - 1. C97 - Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 - 2. C99 - Standard Test Method for Modulus of Rupture of Dimension Stone.
 - 3. C170 - Standard Test Method for Compressive Strength of Dimension Stone.
 - 4. C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
 - 5. C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
 - 6. C484 - Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile.
 - 7. C501 Relative Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion.
 - 8. C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 9. C648 - Standard Test Method for Breaking Strength of Ceramic Tile.

10. C650 - Standard Test Method for Resistance of Ceramic Tile to Chemical Substances.
11. C672/C672M - Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
12. C880 - Standard Test Method for Flexural Strength of Dimension Stone.
13. C1026 - Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling.
14. C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
15. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
16. E662 - Specific Optical Density of Smoke Generated by Solid Materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 1. Each variety of quartz material indicated.
 2. Accessories, mountings, and other manufactured products.
 3. Manufacturer's Care and Maintenance information.
- B. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
 1. Coordination drawings shall be prepared indicating:
 - a. Coordinating Plumbing work.
 - b. Coordinating Electrical work.
 - c. Miscellaneous steel for the solid-surface installation.
 - d. Indicate location of all adjacent walls (rated and non-rated), blocking locations and recessed wall items, etc.
 2. Content: Project-specific information, drawn accurately to scale.
 3. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
 4. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
 - a. Minor dimension changes and difficult installations will not be considered changes to the contract.
- C. Samples: For each quartz surface type indicated, in sets of Samples not less than four inches square. Include two or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.
- D. Qualification Data for Installer: Work of this section shall be performed by a certified fabricator/installer approved in writing by the quartz surface manufacturer.
- E. Sealant Compatibility Test Report: From sealant manufacturer indicating that sealants will not stain or damage the selected quartz materials.

- F. Maintenance Data: For stone countertops to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator and Installer Qualifications: Companies that employ skilled workers who regularly supply quartz surfaces similar to those indicated for this Project and whose finished products have a record of successful in-service performance.
- B. Source Limitations: Obtain each variety of quartz from a single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.
- C. Allowable tolerances:
 - 1. Variation in component size: 1/16" max..
 - 2. Location of openings: 1/8" from indicated location.
- D. Mockup: Build mockup to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical countertop as shown on Drawings, in location approved by Architect.
 - 2. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Store in racks in a near vertical position. Prevent warpage and breakage. Store inside away from direct exposure to sunlight.
- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive quartz fabrications by field measurements before fabrication and indicate measurements on shop drawings.

1.8 WARRANTY

- A. Provide written manufacturer's warranty against defects in materials and workmanship for a minimum of ten (10) years after substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cambria
 - 2. Silestone by Cosentino
 - 3. Zodiac by Dupont
 - 4. Cosmos Quartz by Cosmos Granite & Marble
- B. Color, pattern, and finish to be selected by Architect from manufacturer's full range.

2.2 MATERIALS

- A. Material: Quartz aggregate mixed with high performance polyester resin, pigments and special effects, formed into flat slabs.
- B. Thickness:
 - 1. At vertical surfaces: 2 cm (min.)
 - 2. At horizontal surfaces: 3 cm (min.)
- C. Material shall be labeled with manufacturer's identifying mark.
- D. Edge Detail: Eased edge (slight radius).
- E. Provide 3/4" (2 cm) thick, 4" high backsplashes where indicated.

2.3 ACCESSORIES

- A. Mounting Adhesive:
 - 1. Provide structural grade "50 year" adhesive.
 - 2. Acceptable manufactures:
 - a. Cambria (Two Part Acrylic Adhesive)
 - b. Akemi North America.
 - c. Bonstone Material Corporation.
- B. Quartz Surface Adhesive:
 - 1. Provide epoxy or polyester adhesive of a type recommended by manufacturer for application and conditions of use.
 - 2. Acceptable adhesive manufactures:
 - a. Cambria (Two Part Acrylic Adhesive)
 - b. Akemi North America
 - c. Bonstone Materials Corporation.

3. Adhesives and joint materials which will be visible in finished work shall be tinted to match quartz surface.
- C. Joint Sealant: Clear 100% silicone sealant of type recommended by manufacturer for application and use.
 1. Provide anti-bacterial type in toilet, bath, and food preparation areas.
- D. Solvent: Denatured alcohol for cleaning quartz surfacing to assure adhesion of adhesives and sealants.
- E. Cleaning Agents: Mild soap and water.

2.4 FABRICATION

- A. Fabricator: Fabricator shall be by a certified in writing by Quartz manufacturer.
- B. Layout:
 1. Layout surface to minimize joints and avoid L-shaped pieces of quartz surfacing. Layout and fabricate with 'hairline' joints.
 2. Cut quartz panels accurately to required shapes and dimensions, with hairline joints.
 3. Fabricate slabs with as few joints as possible over the length of each continuous surface.
- C. Inspection of Materials:
 1. Inspect materials for defects prior to fabrication.
- D. Tools: Cut and polish with water cooled powered tools.
- E. Cutouts:
 1. Cutouts shall have a minimum of 3/8 inch (10mm) radius, slightly eased at bottom.
 2. Where edges of cutouts will be exposed in finished work; radius and polish edges.
- F. Laminations:
 1. Laminate layers of quartz surfacing as required to create built up edges following procedures recommended by the manufacturer.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION EXAMINATION

- A. Examine substrates indicated to receive quartz surfaces and conditions under which quartz will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of quartz surfaces.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3. Verify dimensions by field measurements prior to installation.
4. Verify that substrates supporting quartz surfaces are plumb, level and flat and that all necessary supports and blocking are in place.

- B. Inspection of Quartz Surfaces:
1. Inspect materials for defects prior to installation.

3.2 PREPARATION

- A. Prepare Surface:
1. Clean surfaces prior to installation.
- B. Protection of Quartz Surfaces:
1. Protect finished surfaces from scratches. Apply masking where necessary. Take necessary precautions to prevent dirt grit dust and debris from other trades from contacting the surface.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches.
- B. Variation from Level: Do not exceed 1/8 inch in 120 inches, 1/4 inch maximum total.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
- D. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.
- E. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION

- A. Preliminary Installation:
1. Position materials to verify the correct size.
 2. If size adjustments, or additional fabrication is necessary, use water cooled tools. Protect jobsite and surface from dust and water . Perform work away from installation site if possible.
 3. Allow gaps for expansion of not less than 1/8 inch(1.5mm) per ten feet when installed between walls or other fixed structure.
- B. Permanent Installation:
1. After verification of fit and finish, clean substrate; remove loose and foreign matter which may interfere with adhesion. Clean quartz surface backside and joints with denatured alcohol.

2. Horizontal surface: Apply continuous bead of mounting adhesive around perimeter of structural substrate and supports.
 3. Vertical surface: Apply continuous bead of mounting adhesive around perimeter. In addition, apply ¼ inch mounting adhesive bead every 8 inches on vertical center.
 4. Install quartz surfacing plumb, level, square and flat to within 1/8 inch in ten feet, non-cumulative. Align adjacent pieces in same plane.
- C. Joints Between Adjacent Pieces of Quartz Surfacing:
1. Joints shall be flush, tight fitting, level and neat.
 2. Securely join adjacent pieces with adhesive.
 3. Fill joints level to polished surface.
 4. Secure adjacent quartz surfaces with vacuum clamps until adhesive hardens.
- D. REPAIR, CLEANING, PROTECTION
1. Repair or replace damaged or chipped material in a satisfactory manner.
 2. Remove masking, excessive adhesive and sealants. Clean exposed surfaces with denatured alcohol.
 3. Protect installed fabrications with non-staining sheet coverings.

END OF SECTION 066119

SECTION 071353 - ELASTOMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Adhered sheet waterproofing membrane systems.
 - 2. Molded-sheet drainage panels.
- B. Related Sections include the following:
 - 1. Division 03 Sections for Concrete
 - 2. Division 04 Sections for Structural Concrete Masonry Units
 - 3. Division 07 Sections for Joint Sealants
 - 4. Division 07 Sections for Thermal Insulation
 - 5. Division 33 Sections for Subdrainage

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of units required for this Project.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight and rain.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp, wet, or frozen substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Installer's Warranty: Form signed by Installer, covering Work of this Section, for warranty period of two (2) years.
 - 1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Waterproofing system shall be capable of performing as a continuous watertight installation and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Waterproofing shall accommodate normal substrate movement, construction

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material transitions, opening transitions, penetrations, and perimeter conditions without resultant moisture deterioration.

- B. Provide waterproofing system materials that are compatible with adjacent materials under conditions of service and substrates on which product is applied, as recommended by waterproofing manufacturer based on testing and field experience.

2.2 SELF-ADHERING SHEET WATERPROOFING – BELOW GRADE

- A. Adhesive waterproofing membrane specifically designed for below grade waterproofing, composed of modified bitumen or rubberized asphalt with a laminated woven polyethylene facer. A silicone release paper protects the adhesive side of the membrane.
 - 1. Thickness: 56 mils (min) or 60 mil
 - 2. Tensile Strength (Membrane): 250 psi (min.), ASTM D-412
 - 3. Tensile Strength (Film): 5000 psi
 - 4. Elongation: 300% minimum, ASTM D-412
 - 5. Permeance: 0.05 Perm (max), ASTM E-96
 - 6. Flexibility, 180° bend over 1 in. mandrel at -45°F: Unaffected, ASTM D-1970
 - 7. Crack Cycling at -25°F (100 cycles): Unaffected, ASTM C-836
 - 8. Peel Strength: 4.5 lb/in (min), ASTM D-903
 - 9. Lap Adhesion: 8.6 lb/in (min) ASTM D-1876
 - 10. Puncture Resistance: 48 lb (min), ASTM E-154
 - 11. Water Absorption: 0.2% (max), ASTM D-1228
 - 12. Hydrostatic Head: 230 ft. (min), ASTM D-5385
- B. Self-adhering sheet applied to the positive side of below-grade structures such as foundation walls and footings.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bituthene 3000 by GCP Applied Technologies
 - b. TremProof 560A by Tremco, Inc.
 - c. CCW MiraDri 860/861 by Carlisle Syntec
 - d. Mel-Rol by W.R. Meadows
- C. Self-adhering sheet applied to below-grade structures on the blind-side, pre-applied for waterproofing cast-in-place concrete.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. TremProof Amphibia by Tremco, Inc.
 - b. CCW MiraPLY by Carlisle Syntec
 - c. HydraStop SA by W.R. Meadows

2.3 BLINDSIDE SHEET WATERPROOFING

- A. Bonded composite sheet membrane system designed for waterproofing of below ground structural concrete surfaces under continuous or intermittent hydrostatic pressure. High-strength polyethylene or polypropylene membrane laminated to a waterproofing layer, with or without a geotextile fabric facing.
 - 1. Thickness: 45 mils, minimum

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2. Tensile Strength: 800 psi (min.), ASTM D-412
3. Elongation: 500% minimum, ASTM D-412
4. Permeance: 0.05 Perm (max), ASTM E-96
5. Flexibility at -20°F: Unaffected, ASTM D-1970
6. Crack Cycling at -15°F: Unaffected, ASTM C-836
7. Peel Strength Adhesion to Concrete: 5.0 lb/in (min), ASTM D-903
8. Lap Adhesion: 6.9 lb/in (min) ASTM D-1876
9. Puncture Resistance: 225 lb (min), ASTM E-154
10. Hydrostatic Head: 100 ft. (min), ASTM D-5385

- B. Horizontal sheet applied to below-grade structures on the blind-side, pre-applied for waterproofing cast-in-place concrete, including slabs-on-grade.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Blueskin PreSeal 435 by Henry Comapny
 - b. CCW MiraPLY-H by Carlisle Syntec
 - c. Underseal XT 850 by Polyguard Products, Inc.

2.4 SELF-ADHERING SHEET WATERPROOFING – BALCONY

- A. Waterproofing membrane system designed to be used specifically over wood deck balcony structures, that will be covered with structural standard/lightweight concrete topping slabs.
1. Product: Basis of Design: “Balconyguard” by Polyguard.
 2. Or Equal -- for Substitution Request:
 - a. Provide a detailed comparison of the qualities of the proposed substitution with those of the systems specified.
 - b. Provide all product data for all proposed components.
 - c. Provide a statement of why the substitution is preferred, and what advantages the substitution will have for the project.
 - d. Provide a list of completed installations using the proposed products, with project names and addresses and names and addresses of architects, contractors, installers, and owners.
- B. System Components:
1. Cold-applied, high-density polyethylene (HDPE) backing laminated to a layer of waterproofing adhesive compound with a high-strength nonwoven geotextile fabric reinforcement.
 - a. Thickness: 60 mils min membrane.; 85 mils min. total with backing and fabric.
 2. Manufacturer’s recommended liquid adhesives and liquid membrane compounds for primer, and edge and joint sealant.
 3. Rubberized tape sealants for use around penetrations, edges, and seams.
 4. Sheet molded drainage mat, if recommended by waterproofing manufacturer, to allow water drainage out of balcony systems.

2.5 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Surface Primer: Solvent based primer used specifically for self-adhered membranes. Primer is composed of a blend of natural resins and solvent/synthetic rubber; may be spray or roller applied
- C. Exposed Sheet Flashing: 60-mil-thick, cured or uncured, as required by manufacturer.
- D. Bonding Adhesives: Adhesive for bonding polymeric sheets and sheet flashings to substrates and projections.
- E. Splicing Cement and Cleaner: Single-component butyl splicing cement and solvent-based splice cleaner.
- F. Backer Rod: Shall be closed-cell polyethylene foam rod.
- G. Joint Sealants: Single component, high performance, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant.
- H. Waterproofing and Sheet Flashing Accessories: Provide sealants, pourable sealers, cone and vent flashings, inside and outside corner flashings, termination reglets, and other accessories recommended by waterproofing manufacturer for intended use.
- I. Metal Termination Bars: Manufacturer's standard aluminum or stainless steel bars, with upper flange to receive sealant.

2.6 PROTECTION AND DRAINAGE PANELS

- A. Board Insulation: Extruded-polystyrene foam board insulation complying with ASTM C 578, square or shiplap edged, Type X, 1/2 inch thick.
 - 1. Type VII, 60-psi minimum compressive strength.
- B. Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, spun-bonded filter fabric facing laminated to one side of a studded, non-biodegradable, polystyrene or polypropylene drainage core.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hydroduct by GCP Applied Technologies
 - b. Henry Drain Board by Henry Comapny
 - c. MiraDrain by Carlisle Syntec
 - d. PolyFlow 15 or 18 by Polyguard Products, Inc.
- C. Protection Board: When recommended by waterproofing manufacturer, provide one of the following:

1. Fabric: thick, non-woven polypropylene or polyester cushioning fabric.
2. Foam board: high-density rigid insulation board.
3. Extruded hollow-core polypropylene/polyethylene polymer sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 1. Do not proceed with installation until after the minimum concrete curing period recommended by waterproofing manufacturer.
 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 3. Notify Architect in writing of anticipated problems using waterproofing over substrate.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.3 SHEET INSTALLATION

- A. Install sheets over entire area to receive waterproofing according to manufacturer's written instructions and recommendations.
- B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required.
- C. Apply bonding adhesive to substrates at required rate and allow to partially dry.

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- D. Apply bonding adhesive to sheets and firmly adhere sheets to substrates using rollers or pressure as required.
- E. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending beyond repaired areas in all directions.

3.4 SHEET FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to waterproofing manufacturer's written instructions.
- B. Form wall flashings using exposed sheet flashing.
- C. Extend deck sheet waterproofing to form wall flashings.
 - 1. Flash penetrations and field-formed inside and outside corners with uncured sheet flashing.
 - 2. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- D. Cover expansion joints and discontinuous deck-to-wall or deck-to-deck joints by extending deck sheet waterproofing over joints.
- E. Terminate and seal top of sheet flashings.

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course and drainage panels over waterproofing membrane according to manufacturer's written instructions and before beginning subsequent construction operations. Minimize exposure of membrane.
- B. Insulation Boards: Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 1/2 inch of projections and penetrations. Stagger end joints and tightly abut insulation units.

3.6 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.
- B. Flood Testing: Flood test each waterproofed area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

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1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
2. Flood each area for 48 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

3.7 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071353

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Perimeter insulation under slabs-on-grade.
 - 2. Perimeter wall insulation below grade (supporting backfill).
 - 3. Cavity wall batt insulation
 - 4. Exterior wall continuous board insulation.
 - 5. Cellulose insulation.
 - 6. Spray-Foam insulation.
- B. Related Sections include the following:
 - 1. Division 04 Sections for insulation installed in filling masonry cells.
 - 2. Division 05 Sections for metal framed structures and assemblies, including fasteners and miscellaneous metal components.
 - 3. Division 06 Sections for wood framed walls and roofs, and wood sheathing requirements.
 - 4. Division 07 Sections for joint sealants and fire resistive penetrations in insulated assemblies.
 - 5. Division 07 Sections for roofing and insulation boards in roof construction.
 - 6. Division 08 Sections for insulating around windows, doors, storefronts, curtainwalls, and other exterior opening types.

1.3 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide insulation where indicated in ceiling plenums whose test performance is rated for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
- B. Closed-Cell Polystyrene Foam Boards:
 - 1. Polyisocyanurate Insulation (abbreviated: ISO or PIR): per ASTM C-1289, of Type and density indicated.
 - 2. Expanded Polystyrene (EPS): per ASTM C-578, of Type and density indicated.
 - 3. Extruded Polystyrene (XPS): per ASTM C-578, of Type and density indicated.

4. All foam board products to have maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
 - C. ASTM C-665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing: Type, Class, and Category per application.
 - D. Mineral Fiber Block and Board Insulation: per ASTM C-612, composed of rock, slag, or glass processed from the molten state into fibrous form and bonded with organic or inorganic binders.
 1. Category 1: use when no compressive resistance properties are required.
 2. Category 2: use when minimum compressive resistance is required.
- 1.4 SUBMITTALS
- A. Product Data: For each type of product indicated. Submit manufacturer's catalog data and application instructions for each material proposed for use.
 - B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.
- 1.5 QUALITY ASSURANCE
- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
 - B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 1. Surface-Burning Characteristics: ASTM E-84.
 2. Fire-Resistance Ratings: ASTM E-119.
 3. Combustion Characteristics: ASTM E-136.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
 - B. Protect plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Polystyrene Board Insulation for above-ground wall applications:

1. EPS Type II or Type IX per ASTM C 578
 - a. Minimum compressive strength 15.0 psi.
2. XPS Type IV, X, XII, or XIII per ASTM C 578
 - a. Minimum compressive strength 15.0 psi.
3. ISO/PIR Type II per ASTM C 1289, Class 1 or 2
 - a. Minimum compressive strength 16.0 psi.
4. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Foamular" by Owens Corning
 - b. "Styrofoam Cavitymate" by DuPont
 - c. "ThermalStar" by Atlas Molded Products

B. Polystyrene Board Insulation for under concrete floor slabs and concrete footings:

1. EPS Type XIV or XV per ASTM C 578
 - a. Minimum compressive strength 40.0 psi.
2. XPS Type VI or VII per ASTM C 578
 - a. Minimum compressive strength 40.0 psi.
3. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Foamular 400" by Owens Corning
 - b. "Styrofoam Highload 40" by DuPont
 - c. "ThermalStar" by Atlas Molded Products

C. Polystyrene Board Insulation for below-grade walls: fabricated with one side having a pattern of drainage channels.

1. EPS Type IX or Type XIV per ASTM C 578
 - a. Minimum compressive strength 25.0 psi.
2. XPS Type IV or VI per ASTM C 578
 - a. Minimum compressive strength 25.0 psi.
3. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Foamular InsulDrain" by Owens Corning
 - b. "Styrofoam Perimate" products by DuPont

2.2 GLASS-FIBER BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread of 25 and maximum smoke-developed indexes 50; passing ASTM E 136 for combustion characteristics.

1. At interior cavities only, unless otherwise noted.

- B. Kraft-Faced Glass-Fiber Blanket Insulation: Provide thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C665, Type II, Class A, Category 1 (blankets with a nonreflective vapor-retarder membrane covering one principal face and functioning as a vapor retarder).
 - 1. At all building-envelope cavities, unless otherwise noted, with paper facing the interior.
- C. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III, Class A, Category 1 (blankets with a reflective membrane and functioning as a vapor retarder), with one principal face with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Where indicated in sloped cavities, with foil facing the interior and an air space on the unfaced side of the blanket.
- D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - 1. 3-1/2 inches thick with a thermal resistance of R-13 or more
 - 2. 5-1/2 inches thick with a thermal resistance of R-19 or more
 - 3. 6-1/2 inches thick with a thermal resistance of R-22
 - 4. 8 inches thick with a thermal resistance of R-25
 - 5. 10 inches thick with a thermal resistance of R-30
 - 6. 12 inches thick with a thermal resistance of R-38

2.3 MINERAL-WOOL INSULATION

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.
- B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type IA (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Reinforced-Foil-Faced, Mineral-Wool Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
- D. Mineral-Wool Board Insulation: ASTM C-612 Type II unfaced, passing ASTM E-136 for combustion characteristics; with maximum flame-spread and smoke-developed indexes of 15 and 0, respectively, per ASTM E 84.
 - 1. For use as exterior continuous insulation, subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include the following:
 - a. "Comfortboard 80" by Rockwool
 - b. "MinWool-1200 Industrial Board" by Johns Manville

2.4 SPRAY FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, Medium density.
 - 1. Product: Subject to compliance with requirements, products for continuous insulation applications may include:
 - a. “MD-C-200” by Icynene, Inc.
 - b. “Tigerfoam Quick Cure Surface Spray” by Commercial Thermal Solutions Inc.
 - c. “Heatlock Eco” by Huntsman Building Solutions
- B. Physical Properties:
 - 1. Thermal Resistance (for 1 inch of material): minimum 6.0 per inch @75 deg F
 - 2. Air Permeance (for 1 inch of material): ASTM E 283: 0.02 L/s.m2 @75 Pa max.
 - 3. Water Vapor Transmission (for 1.5 inches of material): ASTM E 96; 0.9 perms max.
 - 4. Flame Spread and Smoke Developed Rating: ASTM E 84
 - a. Flame Spread: Less than 25
 - b. Smoke Development: Less than 450
 - 5. Closed Cell Content (ASTM D 2856) at least 90%

2.5 CELLULOSE INSULATION

- A. Spray-Applied Cellulose Insulation for exposed applications:
 - 1. Properties:
 - a. ASTM C-1149 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation: Type 1, material applied with liquid adhesive and suitable for either exposed or enclosed applications.
 - b. ASTM C-1497 Standard Specification for Cellulosic Fiber Stabilized Thermal Insulation: Stabilized cellulosic fiber thermal insulation is produced by the addition of adhesive(s) to loose-fill cellulosic fiber insulation, to provide properties such as fire resistance, and reduce settling after curing.
 - c. Product shall be Class 1 Class A per ASTM E-84/ UL 723.
 - d. Cannot contain any added Urea-Formaldehyde resins.
 - 2. Product: Subject to compliance with requirements, products for continuous insulation applications may include:
 - a. “K-13 High-R” System by International Cellulose Corporation
 - 3. Exposed color to be selected from manufacturer’s standard available colors.
- B. Blown-In, Loose-Fill, Dense-Packed Cellulose Insulation for concealed applications:
 - 1. Properties:
 - a. ASTM C-739 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation: chemically treated, recycled cellulosic fiber loose-fill type thermal insulation for use in attics or enclosed spaces in framed buildings within the ambient temperature range from -45 to 90°C by pneumatic or pouring application.
 - b. Average weight per square foot: 1.6 lbs/sq.ft.
 - c. Minimum installed density per cubic foot: 3.5 lbs/cu.ft.
 - d. Product shall be Class 1 Class A per ASTM E-84/ UL 723.
 - e. Treated with Boric Acid (H₃BO₃) for fire, rot, and pest resistance.

- f. Thickness: At ceiling-to-roof assemblies, approx. 14 inches deep, or as required for R-49 thermal value.
2. Product: Subject to compliance with requirements, products for continuous insulation applications may include:
 - a. "Sanctuary" or "FRM-100" by Greenfiber-Applegate
 - b. "Premium" by Nu-Wool Co. Inc.
 - c. "Thermolok InCide" by Hamilton Manufacturing Inc.
3. Fiber netting for blown-in insulation support: 100% polypropylene fabric designed to contain dense-packed insulation installations.
 - a. Hanes Insulweb
 - b. Havelok Wool
 - c. Certainteed Optima Fabric
 - d. ADO ProPac

2.6 INJECTION FOAM INSULATION

- A. Foamed-In-Place Insulation: Cellular plastic insulation comprised of a spray-dried polymeric resin and a foaming catalyst concentrate that are combined with water for injection, along with compressed air, into a wall cavity.
 1. Product: Subject to compliance with requirements, products for masonry cell core insulation applications may include:
 - a. "Core Fill 500" by Tailored Chemical Products
 - b. "Aminoplast" by cfi-FOAM, Inc.
 - c. "GacoProFill" by Gaco, a division of Firestone Building Products
- B. Physical properties:
 1. Thermal Resistance (for 1 inch of material): minimum 4.0 per inch @75 deg F
 2. Flame Spread and Smoke Developed Rating: ASTM E 84
 - a. Flame Spread: Less than 25
 - b. Smoke Development: Less than 450
 3. Non-Combustible, Class A
 4. Acoustical STC Rating: Minimum 50 per ASTM E-90

2.7 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.8 INSULATION FASTENERS

- A. Spindle-Type Anchors: Capable of holding insulation of thickness indicated securely in position indicated.
 - 1. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- B. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1/2 inch minimum between face of insulation and substrate to which anchor is attached.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
- D. Galvanized G90 Z-Girts of depths to match exterior board insulation thicknesses. Installed in a vertical or horizontal orientation to accommodate screw attachment of cladding panels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral- or glass-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
 6. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
 - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- E. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
 2. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- F. Stuff mineral- or glass-fiber insulation into miscellaneous voids and cavity spaces. Compact to a maximum of 50 percent of normal volume.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072200 – ROOF DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Rigid insulation panels for use in insulating above deck for roofing assemblies.

1.2 RELATED DOCUMENTS

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

B. Related Sections include the following:

1. Division 05 Section “Metal Decking” for steel and composite roof deck
2. Division 06 “Rough Carpentry” for cant and wood edge strips
3. Division 07 Sections for Membrane Roofing Systems.
4. Division 07 Section “Thermal Insulation” for insulation in building envelope assemblies.
5. Division 07 Sections for built-up, sheet, and fluid-applied waterproofings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C726 Specification for Mineral Fiber Roof Insulation Board
2. ASTM C728 Specification for Perlite Thermal Insulation Board
3. ASTM D312 Specification for Asphalt Used in Roofing
4. ASTM D2822 Specification for Asphalt Roof Cement
5. ASTM D3747 Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation
6. ASTM D4586 Specification for Asphalt Roof Cement, Asbestos-Free

B. Underwriters Laboratories (UL):

1. UL 580 Tests for Uplift Resistance of Roof Assemblies
2. UL 790 Tests for Fire Resistance of Roof Covering Materials

1.4 PERFORMANCE REQUIREMENTS

A. Closed-Cell Polystyrene Foam Boards:

1. Polyisocyanurate Insulation (abbreviated: ISO or PIR): per ASTM C 1289, of Type and density indicated.

2. Expanded Polystyrene (EPS): per ASTM C 578, of Type and density indicated.
3. Extruded Polystyrene (XPS): per ASTM C 578, of Type and density indicated.
4. All foam board products to have maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Submit manufacturer's catalog data and application instructions for each material proposed for use.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.
- C. Shop Drawings: Roof plan showing layout of boards and fastening patterns.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of roof deck insulation through one source from a single manufacturer.
- B. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E 84.
 1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM P7825. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.
- C. Coordinate work with installation of roof covering and associated roof penetrations and counterflashings installed by other sections as work of this section proceeds.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- C. Slit or remove packaging to permit ventilation and cover with breathable tarpaulin or other suitable waterproof coverings.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not install insulation on roof deck when water of any type is present. Do not apply roofing materials when substrate is damp or wet or when proper adhesive temperature cannot be maintained.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Polystyrene Board Insulation, General: as recommended by the roofing system manufacturer as an approved underlayment for the indicated roofing assembly with the required warranty for duration (years) and peak wind gust speed as specified in other Division 07 Sections.
1. EPS Type IX per ASTM C 578
 - a. Minimum compressive strength 25.0 psi.
 2. XPS Type IV per ASTM C 578
 - a. Minimum compressive strength 25.0 psi.
 3. ISO/PIR Type II per ASTM C 1289, Class 1 or 2, Grade 3
 - a. Minimum compressive strength 25.0 psi.
 4. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Styrofoam Deckmate Plus" by DuPont
 - b. "ISO 95+ GL" by Holcim Elevate (previously Firestone Building Products)
 - c. "SecurShield HD Composite" by Carlisle Syntec
- B. Polystyrene Board Insulation for Protected Membrane Roofing Systems: as recommended by the roofing system manufacturer as approved for the indicated roofing assembly with the required warranty duration as specified in other Division 07 Sections.
1. XPS Type V, VI, or VII per ASTM C 578
 - a. Minimum compressive strength 40.0 psi.
 2. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Styrofoam Roofmate" by DuPont
 - b. "Foamular 400" by Owens Corning

- C. Coverboard: as recommended by the roofing system manufacturer as an approved underlayment for the indicated roofing assembly with the required warranty for duration (years) and peak wind gust speed as specified in other Division 07 Sections.
 - 1. ISO/PIR Type II per ASTM C 1289, Class 4, Grade 1, 2, or 3
 - a. Minimum compressive strength 80.0 psi.
 - 2. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Isogard HD Coverboard" by Holcim Elevate (previously Firestone)
 - b. "SecurShield HD Plus" by Carlisle Syntec
 - c. "EnergyGuard HD Coverboard" by GAF

2.2 AUXILIARY INSULATION MATERIALS

- A. Primer: ASTM D41.
- B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation. Use only on approved board insulation types.
- C. Glass (Felt): ASTM D2178, Type IV, heavy duty ply sheet.
- D. Venting Asphalt Base Sheet: ASTM D3672, Type I or Type II.
- E. Roof Cement: ASTM D2822, Type I or Type II, asbestos free; or, D4586, Type I or Type II.
- F. Separation Layer: As recommended by roof membrane manufacturer.
- G. Cant Strip and Tapered Edge Strip: Standard machine cut perlite or wood fiberboard strips in sizes indicated or required.
- H. Base Ply: As recommended by membrane manufacturer.
- I. Pre-Formed Tapered Foam Crickets: Triangular sections of pre-cut tapered and flat filler pieces by same manufacturer as roof insulation panels. 20 psi, Type II, Class 1, Grade 2.
- J. Insulation Adhesive: A spray (full coverage) or bead-applied, two-component polyurethane, construction grade, low-rise expanding foam adhesive approved by the roofing system manufacturer for attaching insulation boards to compatible roof decks.

2.3 INSULATION FASTENERS

- A. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate. Fasteners shall be corrosion resistant with oversized heads. Length of fasteners shall be as recommended by the panel manufacturer.
- C. Nails for securing base sheets, and first ply of vapor retarder, to wood nailers and deck:
 - 1. Type I, Style 20, zinc coated steel roofing nails with minimum head diameter of 10 mm (3/8 inch) through metal discs at least 25 mm (one inch) across; or,

2. One piece nails with an integral flat cap at least 24 mm (15/16 inch) across.
- D. Nails for securing base sheet, building paper, or first ply of vapor retarder to structural wood fiber decks:
 1. Self-clinching type having an integral flat cap not less than 25 mm (one inch) across.
 2. Nails shall have a holding power of not less than 18 kg (40 pounds) per fastener.
 3. Nail shall have flat cap not less than 30 mm (1-1/4 inch) across and shall have a withdrawal resistance of not less than 18 kg (40 pounds) per fastener.
- E. Fasteners for securing insulation to steel decks:
 1. Conform to requirements of Factory Mutual Research Corporation for wind uplift.
 2. Self-drilling galvanized screws with 50 mm (two inch) diameter disk.
 3. Antibackout thread design.
 4. Have a pullout resistance of 14 kg (30 pounds) minimum.
- F. Fastening Plates: Nominal 2-inch to 3-inch diameter plates for insulation board attachment in conjunction with the fastener type as approved by the roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Do not use phenolic, isocyanurate, or urethane board type insulation directly on steel roof decks.

- D. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Apply only as much insulation as can be covered by a complete roof membrane in the same day. Do not leave insulation exposed to the weather.
- F. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply multiple layers of insulation units to produce the total thickness required. A single layer of insulation board is acceptable only on exterior canopies or unheated structures.
- G. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- H. Minimum insulation board thickness at roof drains of 2 inches.
- I. Use crickets to eliminate "gutters" in roof slopes. Do not allow "flat areas" where ponding will occur.

3.4 INSTALLATION SYSTEMS

- A. Fully Adhered Single-Ply Systems:
 - 1. Secure each panel to the roof deck with approved fasteners and plates (appropriate to the deck type).
 - 2. Adhere panels to a prepared concrete deck with a full mopping of hot steep asphalt.
 - 3. Butt edges and stagger joints of adjacent panels.
 - 4. Multi-layer systems: Adhere subsequent layers with a full mopping of hot steep asphalt.
 - 5. In multi-layer installations, stagger joints in top and bottom layers. Do not align joints in insulation.
 - 6. Install the roof covering according to the roof manufacturer's specifications.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, traffic and loads, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072200

SECTION 072500 – WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vapor-permeable, Air and Water Barrier for exterior walls – Membrane Wrap
2. Seam Tapes, Adhesives, and related accessories

1.2 RELATED DOCUMENTS

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

B. Related Sections include the following:

1. Division 04 Sections for concrete block and unit masonry
2. Division 06 Sections for wood framing and exterior wall and roof sheathings
3. Division 07 Sections for siding and other exterior wall veneers
4. Division 07 Sections for metal flashings, flexible flashings, and joint sealants
5. Division 08 Sections for door and window frame types

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D-751 - Standard Test Methods for Coated Fabrics.
2. ASTM D-779 - Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method.
3. ASTM D-882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
4. ASTM D-1117 - Standard Guide for Evaluating Nonwoven Fabrics.
5. ASTM D-1777 - Standard Test Method for Thickness of Textile Materials.
6. ASTM D-3776 - Standard Test Method for Mass Per Unit Area (Weight) of Fabric.
7. ASTM E-84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E-96 - Standard Test Method for Water Vapor Transmission of Materials.
9. 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.
10. ASTM E-330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
11. ASTM E-331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.

1.4 DEFINITIONS

- A. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly per.
- B. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of the building envelope per ASHRAE 90.1.
- C. Vapor Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms or greater, when tested in accordance with ASTM E96. Vapor permeable material permits the passage of moisture vapor through vapor diffusion.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Submit manufacturer's catalog data and installation instructions for each material proposed for use.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building weather barrier as a complete system including accessory materials through one source from a single manufacturer.
- B. Installer shall have experience with installation of similar weather barrier assemblies under similar conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Do not expose to flame or other ignition sources. Store at temperatures at or above 40 degrees F (4 degrees C), free from direct contact with cold or frozen surfaces.
- C. Handling: Protect materials from damage or contamination during handling and installation.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install materials over surfaces that are wet, frozen, or that contain frost. Wet surfaces should be allowed to dry before installing the siding material.

- B. Do not proceed with product application if rainfall is forecast or imminent within 12 hours. Do not apply membrane when air or surface temperatures are below 20 degrees F (-6 degrees C) or are expected to fall below these temperatures within 24 hours of completed application.
- C. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

1.9 WARRANTY

- A. Manufacturer's Field Service: Register Project with weather barrier manufacturer prior to installation of weather barrier and comply with weather barrier manufacturer's Project registration, pre-construction, and observation processes for warranty execution requirements.
- B. Manufacturer's Product and Labor Warranty: Manufacturer agrees to repair or replace weather barrier product that fails due to manufacturing defects that fails within specified warranty period, including reasonable labor for removal and replacement of affected materials to correct problems caused by the defective product up to manufacturer's limits.
- C. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WEATHER BARRIER WRAP

- A. Description: Exterior wall spunbonded polyolefin, non-woven, non-perforated air infiltration barrier and bulk moisture penetration barrier. Includes integral drainage, flashing and sealing of penetrations and seams.
- B. Performance Characteristics:
 - 1. Air Penetration: <.005 cfm/ft² at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 - 2. Water Vapor Transmission: 15 perms or less (grains of water vapor per hour, per square foot, per inch of mercury), when tested in accordance with ASTM E96, Method A.
 - 3. Water Penetration Resistance: 250 cm when tested in accordance with AATCC Test Method 127.
 - 4. Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
 - 5. Tensile Strength: 30 lbs/in. minimum (each Machine and Cross direction), when tested in accordance with ASTM D882.
 - 6. Tear Resistance: When tested in accordance with ASTM D1117, Machine Direction 8 N/mm minimum, and Cross Direction 6 N/mm minimum.
 - 7. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15 max, Smoke Developed: 30 max
 - 8. UV Resistance: 10 months exposure minimum.

- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. “Tyvek Commercial Wrap-D” System by DuPont, Inc. (Basis of Design)
 2. “Typar MetroWrap” System by Fiberweb
 3. “Greenguard” System by Pactiv Building Products

2.2 LIQUID-APPLIED WEATHER BARRIER

- A. Description: Exterior wall single-component, liquid-applied vapor-permeable, air and water barrier which cures to form a tough, seamless, elastomeric membrane to resist air and moisture transmission.
- B. Performance Characteristics:
1. Air Leakage ASTM E2357: 0.04 cfm / ft.2 @ 75 Pa (1.57 lb./ft.2) max..
 2. Air Permeability ASTM E2178: 0.004 cfm /ft.2 @ 75 Pa (1.57 lb./ft.2) max.
 3. Water Vapor Permeance ASTM E96 (Method B): 15 perms minimum.
 4. Elongation ASTM D412: 1000 % minimum.
 5. Flame Spread and Smoke Development, ASTM E84: Class A.
- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. “Tyvek Fluid Applied WB+” by DuPont
 2. “Air-Bloc All Weather STPE” by Henry Company, a division of Carlisle
 3. “AirShield TMP” by W.R. Meadows
 4. “R-Guard Cat 5” by Prosoco, Inc.

2.3 ACCESSORIES

- A. Provide weather barrier manufacturer’s recommended accessory products for the application indicated, including but not limited to:
1. Tape Flashing and Joint Tape
 2. Membrane Adhesives
 3. Joint Sealants
- B. Flexible Flashings and Transition Membranes: Composite flashing material composed of micro-creped, polyethylene laminate with a butyl-based adhesive layer per AAMA 711.
1. FlexWrap by Dupont
 2. Typar Butyl Flashing
- C. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
1. DuPont Weatherization Sealant
 2. Tremco 830
 3. Tremco Butyl
 4. Sealants recommended by the weather barrier manufacturer.

- D. Provide adhesives as recommended by the weather barrier manufacturer:
 - 1. Liquid Nails® LN-109
 - 2. Polyglaze® SM 5700
 - 3. Denso Butyl Liquid
 - 4. 3M High Strength 90

- E. If indicated by the weather barrier manufacturer, provide primer to assist in adhesion between substrate and flashing.
 - 1. 3M High Strength 90
 - 2. Denso Butyl Spray
 - 3. SIA 655
 - 4. Permagrip 105
 - 5. TW TACC Sta' Put SPH

- F. Fasteners: Attach weather barrier wrap according to manufacturer instructions, using common roofing nails, plastic cap nails, tap-con fasteners, or staples having a minimum 1-inch crown. If smaller crown staples are used, then more fasteners must be used. Fasteners must penetrate the underlying substrate or framing a minimum of 1/2 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories, including removal of sharp protrusions and that substrate is dry.

- B. Notify Architect of conditions that would adversely affect installation. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

- B. Start weather barrier installation at a building corner, leaving 6 or more inches of weather barrier extended beyond corner to overlap.

- C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level. Subsequent layers shall overlap lower layers horizontally in a shingling manner

- D. Lap weather barrier over the back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps in veneer are not blocked.

- E. Window and Door Openings: Extend weather barrier completely over openings, to be cut later. Opening preparation and flashing installation is dependent upon the construction of the opening

and construction of the window. Coordinate with other trades for proper detailing at windows, doors and other openings or intersections for proper flashing in accordance with window/door manufacturer guidelines, industry standards and best flashing and waterproofing practices.

- F. Seaming:
 - 1. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
 - 2. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.3 INSTALLATION VERIFICATION

- A. Field Inspection: When each section is complete, the installer shall visually inspect the installation and verify that all penetrations and terminations have been done correctly and that doors and windows have been properly flashed and integrated into the weather barrier material. The installer shall repair any cuts or tears with approved materials and methods.
- B. Some substrates will require additional material to achieve a continuous coating. Inspect surface after application and touch-up as needed. CMU, OSB and exceptionally porous gypsum sheathing may require two coats or layers.

3.4 PROTECTION

- A. Protect installed weather barrier from damage until covered by exterior wall finish materials.
- B. Protect weather barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace weather barrier material or install additional, full-thickness, weather-barrier application after repairing and preparing the overexposed materials in accordance with manufacturer's written instructions.

END OF SECTION 072500

SECTION 072616 – BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Below-grade and under-slab sheet vapor retarder.
- B. Related Sections include the following:
 - 1. Division 03 Sections for Cast-In-Place Concrete
 - 2. Division 07 Sections for Joint Sealants, Thermal Insulation, and other Membrane Waterproofing Systems.
 - 3. Division 31 Sections for Earthwork and Soil Stabilization

1.3 REFERENCE STANDARDS

- A. ASTM E1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- B. ASTM E1643: Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- C. ASTM E154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
- D. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.

1.4 SUBMITTALS

- A. Product Data: Provide technical data and tested physical and performance properties of waterproofing sheet materials and accessories.
 - 1. Include manufacturer's written instructions, including evaluating, preparing, and treating substrate.
 - 2. Manufacturer's installation instructions for sheet placement, seaming, penetration prevention, perimeter sealing, and repairs.

- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints, lap seams, penetration flashings, tape locations, sealant locations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of units required for this Project.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight and rain.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp, wet, or frozen substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Waterproofing system shall be capable of performing as a continuous watertight barrier. Waterproofing shall accommodate normal substrate movement, construction material transitions, and perimeter conditions without deterioration.
- B. Provide waterproofing system materials that are compatible with adjacent materials under conditions of service and substrates on which product is applied, as recommended by waterproofing manufacturer based on testing and field experience.

2.2 SHEET WATERPROOFING

- A. Waterproofing sheet membrane specifically designed as a below-slab vapor barrier and for below grade waterproofing manufactured from polyolefin resins.
 - 1. Thickness: 15 mils.
 - 2. Roll width: 10 feet min.
 - 3. Tensile Strength (Membrane): 72 psi (min.), ASTM E-154
 - 4. Elongation: 300% minimum, ASTM D-412
 - 5. Permeance: 0.01 Perm (max), ASTM E-96
 - 6. Puncture Resistance: 2,200 grams (min), ASTM D-1709
 - 7. Exceeds Class A, B, and C strength for ASTM E-1745
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. "Perminator" 15 mil by W.R. Meadows
 - 2. "Stego-Wrap" 15 mil by Stego Industries Inc.
 - 3. "Griffolyn 15 Mil Green" by Reef Industries, Inc.
 - 4. "Viper II" by ISI Building Products

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish any liquid auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Seam Tape: minimum 4 inches wide as required by manufacturer.
- C. Waterproofing and Sheet Flashing Accessories: Provide sealants, pourable sealers, cone and vent flashings for penetrations, inside and outside corner flashings, termination bars, and other accessories recommended by waterproofing manufacturer for intended use.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance. Notify Architect in writing of any unacceptable conditions.
- B. Level, tamp, or roll earth or granular material substrates where sheets will be overlaid.

3.2 SHEET INSTALLATION

- A. Install sheets over entire area to receive waterproofing according to manufacturer's written instructions and recommendations. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the pour whenever possible.
- B. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
 - 1. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double-sided tape, or both termination bar and double-sided tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
 - 2. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
- C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required, and seal with manufacturer's seam tape.
 - 1. Seal all penetrations, including pipes, per manufacturer's instructions.
- D. Repair tears, voids, and lapped seams in waterproofing, and repair any conditions not complying with requirements. Patch with sheet waterproofing extending beyond repaired areas in all directions.

3.3 FIELD QUALITY CONTROL

- A. Designate a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, and protection.

3.4 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.

- B. Protect membrane from damage and wear during remainder of construction period.
- C. Protect membrane from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where materials be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072616

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Fiberglass-Reinforced Asphalt shingles.
 2. Self-adhering sheet underlayment.
 3. Ridge and hip vents.
- B. Related Sections include the following:
1. Division 06 Sections for rough carpentry and sheathing of wood roof decks.
 2. Division 07 Sections for metal flashings and counterflashings at roof edges, and roof drainage accessories.

1.3 APPLICABLE PUBLICATIONS

- A. American Society for Testing and Materials (ASTM):
1. D-226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
 2. D-1079 – Standard Terminology Relating to Roofing and Waterproofing
 3. D-1970 - Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 4. D-2178 - Asphalt Glass Felt Used in Roofing and Waterproofing
 5. D-3018 - Class ‘A’ Asphalt Shingles Surfaced with Mineral Granules
 6. D-3161 - Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method)
 7. D-3462 - Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
 8. D-7158 - Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)
 9. E-108 - Standard Test Methods for Fire Tests of Roof Coverings
 10. F-1667 - Driven Fasteners: Nails, Spikes, and Staples
- B. Underwriter’s Laboratories Inc. (UL):
1. UL-790 – Standard Test Methods for Fire Resistance of Roof Covering Materials.
 2. UL-2218 - Standard for Safety Impact Resistance of Prepared Roof Covering Materials
 3. UL-1897 - Safety Uplift Tests for Roof Covering Systems

- C. Roofing Terminology: Refer to ASTM D-1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For the following products, of sizes indicated, to verify color selected.
 - 1. Asphalt Shingle: Full-size asphalt shingle strip.
 - 2. Ridge and Hip Cap Shingles: Full-size ridge and hip cap asphalt shingle.
 - 3. Ridge Vent: 12-inch-long Sample.
 - 4. Exposed Valley Lining: 12 inches square.
 - 5. Self-Adhering Underlayment: 12 inches square.
- C. Qualification Data: For Installer, including certificate signed by shingle roofing manufacturer stating that Installer is approved, authorized, or licensed to install roofing system indicated.
- D. Maintenance Data: For asphalt shingle roofing systems to include in maintenance manuals.
- E. Warranties: Special, job-specific warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that is approved, authorized, or licensed by asphalt shingle roofing system manufacturer to install roofing system indicated.
- B. Source Limitations: Provide all primary roofing products, including shingles, underlayment, ice and water barrier, and ventilation, by a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class **A**; ASTM E-108 or UL-790, for application and roof slopes indicated.
- D. Wind Resistance: meet ASTM D-3161 or UL-997.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.
- B. Preinstallation Conference: Meeting to be assembled by the roofing manufacturer's certified installing contractor. Meeting's mandatory attendees shall include the certified contractor, the general contractor, and the manufacturer's representative.
 1. Review all pertinent requirements for the project, including but not limited to, scheduling, weather considerations, project duration, and requirements for the specified warranty.

1.8 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal.
 1. Material Warranty Period: **50** years from date of Substantial Completion, or Lifetime.
- B. Workmanship Warranty: Supplemental warranty to cover all costs for labor and materials installation following manufacturer approved application of shingle roofing system:
 1. Workmanship Warranty Period: **5** years from date of Substantial Completion.
- C. Wind Warranty: Manufacturer's additional form in which products are warranted to resist blow-off due to wind velocities, including gusts, up to 130 m.p.h.:
 1. Wind Warranty Period: **15** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS-FIBER REINFORCED ASPHALT SHINGLES

- A. General: Laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
- B. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "Landmark PRO" series by CertainTeed Corp.
 - 2. "Timberline HDZ" by GAF Materials Corp.
 - 3. "Heritage" by Tamko Building Products.
- C. Characteristics:
 - 1. Simulated wood-shake dimensional appearance with 5-5/8" min. exposure.
 - 2. Surface treated to resist algae growth and discoloration.
 - 3. Color and Blends: As selected by Architect from manufacturer's full range.
- D. Hip and Ridge Shingles: Manufacturer's standard self-sealing units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Full-Deck coverage of leak-barrier, ice and water shield membrane.
- B. Self-Adhering Sheet Underlayment, Granular Surfaced: minimum of 55-mil-thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; self-adhesive with release paper backing; cold applied.
- C. Self-Adhering Sheet Underlayment, High Temperature: Minimum of 30-mil-thick, slip-resisting, polyethylene-film-reinforced top surface laminated to layer of butyl or SBS-modified asphalt adhesive, self-adhesive with release paper backing; cold applied.
 - 1. Thermal Stability: Stable after testing at 240 deg F, ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F, ASTM D 1970.
 - 3. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - a. "Blueskin PE200HT" by Henry Company, a division of Carlisle
 - b. "Deckguard HT" by Polyguard Products
 - c. "Grace Ultra" by GCP Applied Technologies, Inc.
- D. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.
- E. Sheet Metal Valley Flashing:
 - 1. 24 Gauge steel with minimum G115/Z350 galvanized coating.
 - 2. 22 Gauge (0.025", 0.63 mm) thick aluminum, mill finish.
 - 3. Cold rolled copper sheet; 16 ounces per square foot (0.55 mm), natural finish.

- F. Starter Strip: Self-sealing eave and rake starter shingle for edge courses.

2.3 ACCESSORIES

- A. Ridge Vent: Rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with baffles to deflect rain and snow, designed to vent attic air out from under ridge shingles.
 - 1. Minimum Net Free Area: 16 in. per lineal foot min.
 - 2. Width: 7" min.
- B. Roof Louvered Vents: slant-back, low-profile metal or high-impact resin exhaust ventilator units designed to vent air out of attics. Verify required net free ventilation area and confirm locations and placement of vents with Architect.
- C. Roofing Nails: Hot-dip galvanized steel wire shingle nails, minimum 0.120-inch-diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate at least 3/4 inch into solid wood decking or extend at least 3/8 inch through OSB or plywood sheathing.
 - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
 - 2. Low profile capped heads or disc caps, 1-inch minimum diameter.

2.4 METAL FLASHING AND TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
 - 1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 - 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
 - 3. Cricket Flashings: Fabricate with concealed flange extending a minimum of 18 inches beneath upslope asphalt shingles and 6 inches above the roof plane.
 - 4. Open Valley Flashings: Fabricate in lengths not exceeding 10 feet with 1-inch-high inverted-V profile at center of valley and equal flange widths of 12 inches.
 - 5. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: pre-formed with sleeve at least 6 inches high, and stainless steel or aluminum plate at least 7 inches larger than the penetration diameter.

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.
 - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
 - 3. For the record, prepare written report, endorsed by Installer, listing conditions satisfactory and/or detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EAVE ICE DAM PROTECTION

- A. Drip Edges: Place eave edge and gable edge metal flashing tight with fascia boards.
- B. Apply and lap waterproofing shingle underlayment as eave protection in accordance with manufacturer's instructions.
- C. Extend eave protection membrane minimum 24 inches up slope beyond interior face of exterior wall.
 - 1. Extend eave protection membrane minimum 48 inches up slope at roofs with slopes less than 4:12 pitch.

3.3 ROOFING UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Lap in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches, staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
 - 2. Rakes: Extend from edges of rake 24 inches beyond interior face of exterior wall.
 - 3. Valleys: Extend from lowest to highest point 18 inches on each side.
 - 4. Hips: Extend 18 inches on each side.
 - 5. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
 - 6. Sidewalls: Extend beyond sidewall 18 inches and return vertically against sidewall not less than 4 inches.
 - 7. Dormers, Chimneys, Skylights, and other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches and return vertically against penetrating element not less than 4 inches.

8. Roof Slope Transitions: Extend 18 inches on each roof slope.
9. Vent pipes: Install a 24 inch square piece of self-adhering ice and water barrier lapping over roof deck underlayment; sealed tightly to pipe.

3.4 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements.

3.5 ASPHALT SHINGLE INSTALLATION

- A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge.
 1. Extend asphalt shingles 1/2 inch over fascia at eaves and rakes.
 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with roofing nails located according to manufacturer's written instructions.
- E. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest to lowest point.
 1. Set valley edge of asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.
 2. Do not nail asphalt shingles to metal open valley flashings.
- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- G. Ridge and Hip Cap Shingles: Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Concealed-fastener standing-seam metal roof panels and accessories.
- B. Related Sections include:
 - 1. Division 06 Sections for wood roof deck supporting metal roof panels.
 - 2. Division 07 Sections for field-installed thermal insulation above and below roof deck.
 - 3. Division 07 Section "Sheet Metal Flashing and Trim" for other sheet metal work not part of metal roof panel assemblies.
 - 4. Division 07 Sections for roof accessories and air/vapor barriers.
 - 5. Division 07 Section "Joint Sealants" for field-applied sealants.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at the following test-pressure difference:
- C. Water Penetration: No water penetration when tested according to ASTM E-1646.
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E-2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 to resist wind uplift at field, perimeter, and corner uplift pressures indicated by the Structural Engineer.

- F. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel 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.
 - 3. Note: Roofing system components shall meet FM performance criteria, but FM Insurance will not be required on this project.

- G. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E-1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 30 lbf/sq. ft., acting inward or outward.
 - 2. Snow Loads: 15 lbf/sq. ft or as indicated on structural drawings.
 - 3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.

- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Provide calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- I. Thermal Performance: Provide insulated metal roof panel assemblies with thermal-resistance value (R-value) where indicated when tested according to ASTM C-518.

- J. Solar Reflectance: Initial solar reflectance of not less than 0.65 when tested according to ASTM E-903, and maintained, under normal conditions, solar reflectance of not less than 0.50 for 3 years after installation.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

- B. Samples: For each type of metal roof panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of exposed trim and accessories involving color selection.

- C. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Roof panels and attachments.
 - 2. Purlins and rafters.
 - 3. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
 - 4. Accessories: Include details of the following items:
 - a. Flashing and trim.
 - b. Gutters.

- c. Downspouts.
- d. Roof curbs.
- e. Snow guards.

D. Maintenance Data: For metal roof panels to include in maintenance manuals.

E. Warranties: Copy of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

C. Surface-Burning Characteristics: Provide metal roof panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E-84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- 1. Flame-Spread Index: 25 or less.
- 2. Smoke-Developed Index: 450 or less.

D. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E-119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- 1. Identify design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- 2. Combustion Characteristics: ASTM E-136.

E. Preinstallation Conference: Conduct conference at Project site.

- 1. Meet with Owner's insurer if applicable, testing and inspecting agency representative if applicable, metal roof panel installer, metal roof panel manufacturer's representative, deck, purlin, and rafter installers, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
- 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
- 4. Examine deck substrate and purlin and rafter conditions for compliance with requirements, including flatness and attachment to structural members.
- 5. Review structural loading limitations during and after roofing.
- 6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
- 7. Review governing regulations and requirements for insurance, certificates, testing and inspecting, and warranties.
- 8. Review temporary protection requirements for metal roof panel assembly during and after installation.
- 9. Review roof observation and repair procedures after metal roof panel installation.

10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, purlins and rafters, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Workmanship Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

- B. Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A-792, structural quality, Grade 50, Coating Class AZ50, prepainted by the coil-coating process per ASTM A-755
- B. Exposed Coil-Coated Finish:
 - 1. 2-Coat (minimum) Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
 - 2. FEVE Fluoropolymer: AAMA 621. 2-coat fluoropolymer finish containing 100 percent fluorinated ethylene vinyl ether resin in color coat.
- C. Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.
- B. Integral-Standing-Seam Metal Roof Panels: Formed with integral ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and lapping and interconnecting side edges of adjacent panels.

- C. Subject to requirements, products that may be incorporated into the work include, but are not limited to, the following:
 - 1. "Snap-Clad" by Peterson Aluminum Corporation
 - 2. "Cee-Lock" by Berridge Manufacturing Company
 - 3. "Medallion-Lok" by McElroy Metal, Inc.

- D. Physical Characteristics:
 - 1. For roof slopes 3:12 or greater.
 - 2. Seam Height: 1" minimum seam height.
 - 3. Material: 24 ga. G-90 hot-dipped galvanized steel panel.
 - 4. Panel Dimension: 16" o.c.
 - 5. Texture: Smooth
 - 6. Flashing and Trim: Steel, 24 ga, matching panels

2.3 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

- B. Flush-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.

- C. Reveal-Joint-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and flat pan between panel edges; with recessed reveal joint between panels.

- D. V-Groove-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and flat pan between panel edges; with V-groove joint between panels.

2.4 ACCESSORIES

- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

- B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

- C. Gutters and Downspouts: Formed from same material as roof panels and metal thickness according to SMACNA's "Architectural Sheet Metal Manual," complete with end pieces, outlet tubes, and other special pieces as required. Finish downspouts to match gutters.

2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 - 3. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - a. "Blueskin PE200HT" by Henry Company, a division of Carlisle
 - b. "Deckguard HT" by Polyguard Products
 - c. "Grace Ultra" by GCP Applied Technologies, Inc.
- B. Felts: ASTM D 226, 1 layer Type II (No. 30) or 2 layers Type I (No. 15), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.6 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Framing, General: ASTM C-645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.
 - 1. All fasteners in contact with copper shall be copper, brass or series 300 stainless steel.
- C. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads and acceptable to roofing manufacturer. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- E. Glass-Mat Gypsum Sheathing/Substrate Board: ASTM C-1177, Type X, minimum 1/2 inch.
- F. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:
 - 1. Factory-Applied Seam Sealant: Manufacturer's standard hot-melt type.
 - 2. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.

2.7 SNOW GUARDS

- A. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.
 - 1. Surface-Mounted, Plastic, Stop-Type Snow Guards: Clear polycarbonate stops designed for attachment to pan surface of metal roof panels using construction adhesive, silicone or polyurethane sealant, or adhesive tape.
 - 2. Surface-Mounted, Metal, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to pan surface of metal roof panel using construction adhesive, silicone or polyurethane sealant, or adhesive tape.

2.8 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

2.9 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
- B. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

- C. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- D. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Roof perimeter for a distance up from eaves of 24 inches beyond interior wall line.
 - 2. Valleys, from lowest point to highest point, for a distance on each side of 18 inches Overlap ends of sheets not less than 6 inches.
 - 3. Rake edges for a distance of 18 inches.
 - 4. Hips and ridges for a distance on each side of 18 inches.
 - 5. Roof to wall intersections for a distance from wall of 18 inches.
 - 6. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.
- B. Felt Underlayment: Apply in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
 - 1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 6 inches in shingle fashion to shed water.
- C. Apply slip sheet over underlayment before installing metal roof panels.
- D. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.3 THERMAL INSULATION INSTALLATION

- A. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 07 Sections for "Thermal Insulation" and "Roof Deck Insulation".

3.4 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
 - 1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
 - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.6 METAL SOFFIT PANEL INSTALLATION

- A. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
 - 1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

- B. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual" and with Division 07 Section for Sheet Metal Flashing and Trim.

3.8 SNOW GUARD INSTALLATION

- A. Stop-Type Snow Guards: Attach snow guards to metal roof panels with adhesive, sealant, or adhesive tape, as recommended by manufacturer. Do not use fasteners that will penetrate metal roof panels.

3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 074646 – FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fiber cement board panel siding
 - 2. Fiber cement horizontal lap siding
 - 3. Fiber cement soffit, trims, and accessories
- B. Related Sections include the following:
 - 1. Division 05 Sections for Steel and Cold-Formed metal framing
 - 2. Division 06 Sections for Rough Carpentry and Sheathing
 - 3. Division 07 Sections for Sheet Metal Flashing and Trim and miscellaneous metal fabrications.
 - 4. Division 07 Sections for Thermal Insulation and Joint Sealants.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- C. Samples: For each finish product specified, two samples, minimum size 6 by 6 inches, representing actual product, colors, patterns, and textures.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Siding and Soffit: Obtain each type, color, texture, and pattern of siding and soffit, including related accessories, through one source from a single manufacturer.

- B. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build mockup of typical wall area. May become part of the finished Work if deemed acceptable by Architect.
 - 2. Build mockup approximately 48 inches long by 60 inches high. Include outside corner on one end of mockup.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Unload, store, handle, and erect composite panels in a manner to prevent bending, cracking, warping, twisting, and surface damage. Stack panels on platforms or pallets no more than two pallets high, covered with suitable weathertight and ventilated covering.
- B. Store products in manufacturer's unopened packaging until ready for installation. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of composite panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.7 SEQUENCING

- A. Coordinate installation with exterior insulation, battens, anchors, flashings and other adjoining construction to ensure proper sequencing, and to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering.
 - 1. Product Warranty: Limited product warranty against manufacturing defects.
 - a. Plank panel, lap and vertical siding for thirty (30) years.
 - b. Factory-applied Finishes for fifteen (15) years.
 - c. Trim for ten (10) years.
 - 2. Workmanship Warranty: Installer's application limited warranty for 2 years.

PART 2 - PRODUCTS

2.1 FIBER CEMENT SIDING

- A. Fiber-Cement Siding, General: Siding made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
- B. Finish: Factory primed for field painting.

2.2 PANEL SIDING

- A. Smooth panel flat boards, no surface texture.
 - 1. Panel widths of at least 16 inches, and available up to 48 inches.
 - 2. Panel lengths of at least 8 feet, and available up to 10 feet.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include:
 - 1. "Hardipanel Primed for Paint" vertical siding by James Hardie Building Products Inc.
 - 2. Allura Smooth Vertical Panels by Allura USA, Plycem.

2.3 HORIZONTAL LAP SIDING

- A. Horizontal Pattern: smooth boards, no surface texture.
 - 1. Boards approx. 9-1/4" inches high with 8 inches exposure.
 - 2. Boards approx. 7-1/4" inches high with 6 inches exposure.
 - 3. Boards approx. 5-1/4" inches high with 4 inches exposure.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to:
 - 1. "Hardiplank" horizontal lap siding by James Hardie Building Products Inc.
 - 2. "Savannah Smooth" by Nichiha Fiber Cement
 - 3. "Allura Smooth Lap" by Allura USA, Plycem.

2.4 SOFFIT

- A. Fiber-Cement Soffit: Smooth panel flat boards, no surface texture.
 - 1. Solid (non-vented) panels typical, unless indicated on drawings for vented/perforated locations.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to:
 - 1. "HardiSoffit" by James Hardie Building Products Inc.

2. "NichiSoffit" by Nichiha Fiber Cement

2.5 TRIMS

- A. Pre-cut boards for exposed trim and accent bands.
 1. Thickness: 3/4" minimum; 1" preferred.
 2. Widths: standard 3-1/2" wide, or 5" wide.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to:
 1. "HardTrim 5/4 Smooth" by James Hardie Building Products Inc.
 2. "NichTrim" by Nichiha Fiber Cement
 3. "LP SmartSide 540 Smooth Finish" by Louisiana-Pacific Corporation
 4. "Allura Reversible 5/4 Trim" by Allura USA, Plycem.

2.6 ACCESSORIES

- A. Siding Accessories: Provide starter strips, edge trim, corner caps, seam tapes, furring strips, and other items as recommended by siding manufacturer for building configuration.
 1. Provide accessories made from same material, color, and texture as adjacent siding, unless otherwise indicated.
- B. Rain-screen battens, Z-girts, or hat channels as recommended by the exterior siding panel manufacturer for the system indicated to create an air space and drainage plane.
- C. Decorative Accessories: Provide the following types of decorative accessories as indicated:
 1. Accent trim boards.
 2. Door and window casings.
 3. Moldings, trims, and battens.
- D. Flashing: Provide flexible and metal flashings as recommended by the exterior siding manufacturer for the system indicated.
- E. Elastomeric Joint Sealants: Approved by the fiber cement siding manufacturer.
- F. Fasteners: For fastening fiber-cement siding, use hot-dip galvanized or stainless steel fasteners as recommended by fiber-cement siding manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

- B. Clean substrates of projections and substances detrimental to application. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 INSTALLATION

- A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.
 - 1. Locate splices at least 12 inches away from window and door openings.
 - 2. Block framing between studs where siding horizontal joints occur.
 - 3. Place fasteners no closer than 3/8 inch from panel edges and 2 inches from panel corners.
- B. Wind Resistance: Where a specified level of wind resistance is required, siding is to be attached to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
- C. Isolate dissimilar metals by separating with rubber gaskets or elastomeric sealant. Use rubber washers where fasteners made from dissimilar metal penetrate siding. Isolate dissimilar metals behind siding by covering with polyethylene film.

3.3 FINISHING

- A. Finish factory-primed siding with at least one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats, or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat, within 60 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
- B. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
- C. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 075423 – THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fully Adhered TPO membrane roofing system.
- B. Related Sections include the following:
 - 1. Division 05 Sections for metal roof deck and structural steel roof framing.
 - 2. Division 06 Sections for miscellaneous rough carpentry for wood nailers, curbs, blocking, and for wood-based, structural-use roof deck panels.
 - 3. Division 07 Sections for Thermal Insulation and Roof Deck Insulation.
 - 4. Division 07 Sections for roof penetration flashings, counterflashings, and joint sealants.
 - 5. Division 07 Sections for roof hatches and other roof accessories.
 - 6. Division 22 Sections for plumbing vent, drain, and piping penetrations through roofs.
 - 7. Division 23 for HVAC equipment to be roof-mounted.

1.3 DEFINITIONS

- A. TPO: Thermoplastic polyolefin.
- B. 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.
- C. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

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. UL 580 Standard for Tests for Uplift Resistance of Roof Assemblies: Class 90.
- D. FMG (Factory Mutual Global) 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
 - 3. Note: Roofing system components shall meet FM performance criteria, but FM Insurance will not be required on this project.
- E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the firetest-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.
- F. All TPO roofing shall comply to FM-I-90 uplift rating for high wind testing.
- G. Energy Performance per ANSI/CRRC-S100 standard (formerly CRRC-1), Standard Test Methods for Determining Radiative Properties of Materials:
 - 1. Provide roofing system with tested initial solar reflectance not less than 0.70 and emissivity not less than 0.75.

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. Tapered insulation, including slopes.
 - 3. Fastening patterns.
- C. Samples for the following products:
 - 1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.

- D. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- H. Maintenance Data: For roofing system to include in maintenance manuals.
- I. Warranties: Manufacturer's and Installers' warranty forms for execution.

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. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane or as approved by roofing membrane manufacturer.
- C. Prior to roofing system installation, roofing sub-contractor shall provide a copy of a document issued by the roofing system manufacturer indicating that the project has been reviewed and registered for eligibility to receive the specified warranty.

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 or denting 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. Total System 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, and other components of membrane roofing system.
 - 2. Peak Wind Gust Speed: 72 mph.
 - 3. Warranty Period: **20** years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: 5 (five) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D-6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
 - 1. Thickness: 60 mils, nominal.
 - 2. Exposed Face Color: White
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carlisle SynTec Incorporated.
 - 2. Elevate by Holcim (previously Firestone Building Products Company)
 - 3. GAF Materials Corporation.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
- B. Sheet Flashing:
 - 1. Manufacturer's standard reinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
 - 2. Manufacturer's non-reinforced thermoplastic polyolefin sheet flashing may be used for flashing pipe penetrations, and inside and outside corners, when the use of pre-formed accessories is not feasible.
- C. Pre-formed Flashings:
 - 1. Manufacturer's thermoplastic polyolefin pre-formed cone and vent sheet flashings for vent stacks, roof drains, and other penetrations.
 - 2. Manufacturer's thermoplastic polyolefin pre-formed inside and outside corner sheet flashings, and T-joint covers.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Slip Sheet: Manufacturer's standard, of thickness required for application; if required by manufacturer for the installation.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors and integral caulk ledge.
- G. Fasteners and Fastening Plates: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- H. Miscellaneous Accessories: Provide pourable sealers, lap sealants, termination reglets, and other accessories as required for complete installation.
- I. Provide roofing membrane of same type, material, thickness, and color as roofing membrane on existing International Arrivals Building, as required for patching and extending existing roofing membrane as roof expansion joint.

2.3 SUBSTRATE BOARDS

- A. Substrate Boards, Cover Boards:
 - 1. ASTM C-1177, glass-mat, water-resistant gypsum substrate acceptable to roofing system manufacturer.
 - 2. ASTM C-1289, rigid cellular polyisocyanurate board, Type II, of a type and with facings on both sides acceptable to roofing system manufacturer.
- B. Protection Mat: Polypropylene fabric used either above the membrane as a slip-sheet or as an underlayment to the membrane. Woven or nonwoven polypropylene, polyolefin, or polyester

fabric mat, water permeable and resistant to ultraviolet degradation, type and weight as recommended by roofing system manufacturer for application.

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.

2.5 INSULATION ACCESSORIES

- A. General: Furnish 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. Fluid-Applied Adhesive: Manufacturer's standard fluid-applied adhesive formulated to adhere roof insulation to substrate.

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.
 - 1. Provide around roof access hatches, mechanical equipment, along paths of travel on roofs for regular maintenance activities, and where indicated on drawings.

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 complies with requirements in Division 05 Section "Steel Decking."
 - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.

5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. 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 SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.4 INSULATION INSTALLATION

- A. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

3.5 ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
 1. Unroll roofing membrane and allow to relax before installing.

3.6 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- B. Flood Testing: Contractor shall provide flood testing for each roof deck area for leaks, according to recommendations in ASTM D-5957. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches Maintain 2 inches of clearance from top of sheet flashings.
 - 2. Flood each area for 48 hours.
 - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing membrane installation is watertight.
- 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.

3.7 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period.
- B. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Manufactured Products:
 - a. Manufactured through-wall flashing and counterflashing.
 - b. Manufactured reglets.
 - c. Copings.
 - d. Roof edge flashings.
- 2. Formed Products:
 - a. Formed roof drainage sheet metal fabrications.
 - b. Formed low-slope and steep-slope roof sheet metal fabrications.
 - c. Formed wall sheet metal fabrications.

B. Related Sections:

- 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. Division 07 Sections for membrane roofing, roof shingles, shakes, panels or tiles for installing sheet metal flashing and trim integral with roofing.
- 3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
- 4. Division 07 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the wind uplift forces according to recommendations in FMG Loss Prevention Data Sheets 1-49 and 1-28, for corners, the roof perimeter, and the roof field.

- C. FMG Listing: Manufacture and install copings and roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-90. Identify materials with FMG markings.
 - 1. Note: Roofing system components shall meet FM performance criteria, but FM Insurance will not be required on this project.
- D. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1.5 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- B. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.6 APPLICABLE PUBLICATIONS AND STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. A-167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 2. A-525 - Steel Sheet, Zinc-Coated by the Hot Dip Process
 - 3. A-653 - Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
 - 4. B-32 - Solder Metal
 - 5. B-209 - Aluminum and Aluminum-Alloy Sheet and Plate
 - 6. B-370 - Copper Sheet and Strip for Building Construction
 - 7. D-173 - Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
 - 8. D-412 - Vulcanized Rubber and Thermoplastic Elastomers-Tension

SHEET METAL FLASHING AND TRIM

9. D-1187 - Asphalt Base Emulsions for Use as Protective Coatings for Metal
10. D-1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
11. D-3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
12. D-4586 - Asphalt Roof Cement, Asbestos Free

B. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI):

1. ES-1-2003 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual (current edition).

D. National Association of Architectural Metal Manufacturers (NAAMM)

E. Factory Mutual (FM) – Loss Prevention Data Sheets:

1. 1-28 Wind Design
2. 1-49 Perimeter Flashing
3. 1-29 Roof Deck Securement and Above-Deck Roof Components

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D-2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D-4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: **20** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Corrosion-resistant metals of minimum nominal 26 gauge (0.019-inch (0.483-mm) thickness).
1. For most roof-related applications, provide sheet metals 22 gauge (0.0216-inch thick, 0.55-mm) minimum.
 2. For gutters and downspouts: 20 gauge (0.032-inch thick, 0.81-mm) min.
 3. For wall and opening applications: 24 gauge, (0.025-inch thick, 0.70-mm) min.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
1. Copper Sheet Thicknesses:
 - a. For most applications, 24 gauge copper sheet (0.0216 inch thick, 0.55 mm, 16 oz./sq.ft.) minimum.
 - b. For gutters and downspouts: 22 gauge copper sheet (0.032 inch thick, 0.81 mm, 24 oz./sq.ft.) minimum.
 2. Non-Patinated, Lacquered Exposed Finish: Coated with "Incalac" by StanChem (formulation 69x1732) air-dry coating for copper base alloys with UV inhibitor, applied by air spray in two coats per manufacturer's written instructions to total thickness of 1 mil.
 3. Surface Finish as selected by Architect from one of the following:
 - a. Brushed Satin: Mechanical finish, directionally textured, medium satin
 - b. Polished: Mechanical finish, buffed, specular.
 - c. Pre-Patina: prepatinated according to ASTM B-882.
- C. Aluminum Sheet: ASTM B 209 alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Surface: Smooth, flat.
 2. Aluminum Sheet Thicknesses:
 - a. For most flat applications, provide aluminum sheet 22 gauge (0.024 inch thick, 0.61 mm) minimum.
 - b. For gutters and downspouts: 18 gauge (0.040 inch thick, 1.0 mm) minimum.
 - c. For scuppers and thru-wall fabrications: 16 gauge, (0.050 inch thick, 1.27 mm) minimum.
 - d. For welded fabrications or applications requiring welding: 14 gauge, (0.063 inch thick, 1.62 mm) minimum.
 3. Finish as selected by Architect from one of the following:
 - a. Factory Prime Coating: Where painting after installation is indicated, pretreat with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil (0.005 mm).
 - b. Clear Anodic Finish, Coil Coated: AAMA 611, Anodized Class I, A41 Clear.
 - c. Color Anodic Finish, Coil Coated: AAMA 611, Anodized Class I, A42 Integral.
 - d. Exposed Coil-Coated Finish.

- D. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, dead soft, fully annealed.
1. Finish: 2D (dull, cold-rolled) unless otherwise indicated.
 2. Surface: Smooth, flat.
 3. Stainless Steel Sheet Thicknesses:
 - a. For most flashing applications, provide stainless-steel sheet 26 gauge (0.0187 inch thick, 0.47 mm) minimum.
 - b. For applications with masonry, provide 24 gauge (0.0250 inch thick, 0.63 mm) minimum.
- E. Metallic (Zinc) Coated Galvanized Steel Sheet: ASTM A-653, G90 (Z275) coating designation; structural quality, by coil-coating process to comply with ASTM A-755.
1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 2. Surface Finish for concealed locations: standard zinc.
 3. Surface Finish for exposed locations: Exposed Coil-Coated Finish: Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 4. Galvanized Sheet Thicknesses:
 - a. For most flat flashing applications, provide galvanized sheet 28 gauge (0.019 inch thick, 0.48 mm) minimum.
 - b. For thru-wall flashing applications, provide 26 gauge (0.022 inch thick, 0.56 mm) minimum.
 - c. For applications with masonry, provide 24 gauge (0.028 inch thick, 0.71 mm) minimum.

2.2 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D 4397.
- B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
- D. Rosin Paper Slip Sheet: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m²(6 lbs/100 sf).

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing

and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Copper Sheet: Copper, hardware bronze or Series 300 stainless steel.
 - 3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 - 2. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - 3. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polysulfide polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Bituminous Coating: Cold-applied asphalt emulsion, ASTM D1187, Type I.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound where recommended by flashing manufacturer for exterior nonmoving joints and penetrations.
- H. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- I. Asphalt Roof Cement: ASTM D4586.

2.4 MANUFACTURED ITEMS

- A. Reglets: Units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions, with interlocking counterflashing on exterior face, of same metal as reglet.
1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 2. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 5. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
 6. Finish: Mill.
- B. Counterflashings: Manufactured units designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
- C. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
- D. Canted Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on or compression-clamped metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized steel sheet cant dam, with integral drip edge cleat. Provide matching mitered and welded corner units.
- E. Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip edge cleat to engage fascia cover. Provide matching mitered and welded corner units.
- F. Gravel Stops: Manufactured, one-piece, formed-metal gravel stop in section lengths not exceeding 12 feet with a horizontal flange and vertical leg fascia terminating in a drip edge, continuous hold-down cleat, and concealed splice plates of same material, finish, and shape as gravel stop. Provide mitered and welded or soldered corner units.
- G. Downspout Tongue Nozzle: Manufactured roof drain accessory, cast bronze nozzle and flange, nickel bronze finish, diameter to match roof downspout drain pipes, threaded or no-hub inlet as required, with bird screen.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
 - 1. Gutter Style: As shown on drawings.

2. Expansion Joints: Lap type
 3. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen and valley baffles.
- B. Built-in Gutters: Fabricate to cross section shown on drawings, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch-long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
1. Fabricate gutters with built-in expansion joints and gutter-end expansion joints at walls.
 2. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen
- C. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
- D. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long sections. Furnish with 6-inch-wide, joint cover plates.
1. Joint Style: Lap, 4 inches wide
- B. Copings: Fabricate in minimum 96-inch-long sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of exterior and interior leg. Miter corners, seal, and solder or weld watertight.
1. Coping Profile: See architectural drawings.
 2. Joint Style: Butt, with 12-inch-wide, concealed backup plate.

2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch-high, end dams where flashing is discontinuous.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil-canning, buckling, and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
1. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation

- E. Seal joints as shown and as required for watertight construction.
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder metallic-coated steel and aluminum sheet.
 - 2. Pre-tinning is not required for zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
 - 3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
 - 5. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.
- G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
- C. Built-in Gutters: Join sections with riveted and soldered or lapped joints sealed with sealant. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
 - 1. Install waterproofing underlayment layer in built-in gutter trough and extend to drip edge at eaves and under roof sheathing.
- D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper or gutter discharge.
- E. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls.
 - 2. Provide elbows at base of downspout to direct water away from building where indicated to splash above grade; or:
 - 3. Connect downspouts to underground drainage system indicated.
- F. Splash Pans: Install where downspouts discharge on low-slope roofs.

- G. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
- H. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.4 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that may interfere with uniform oxidation and weathering. Clean off excess sealants.
- B. Clean and neutralize flux materials. Clean off excess solder and weld residue.
- C. Touch-up colored finish coat systems as recommended by manufacturer of finish coating. Remove and replace any component that cannot be successfully repaired at no additional cost to the Owner.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 076500 - FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manufactured through-wall flashing and counterflashing.
 - 2. Self-Adhering elastic flexible flashing
- B. Related Sections:
 - 1. Division 04 Sections for Masonry, for flashing at lintels and sills.
 - 2. Division 06 Sections for Rough Carpentry for framing, wood nailers, curbs, and blocking.
 - 3. Division 07 Sections for membrane roofing, roof shingles, shakes, panels or tiles for installing sheet metal flashing and trim integral with roofing.
 - 4. Division 08 Sections for flashing around openings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Verification Samples: For each product specified, two samples, minimum size 3 x 6 inches, representing actual product, material, and finish.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five year manufacturing experience and capability for design, engineering and technical assistance for the selection, application, and installation of appropriate flashing systems for the project.
- B. Installer Qualifications: Experienced in the proper use and installation of flashing systems, including coordination with flashing of wall assembly components.

1.5 PUBLICATIONS AND STANDARDS

- A. ASTM D-412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
- B. ASTM D-1004 - Standard Test Methods for Initial Tear Resistance of Plastic Film and Sheeting.
- C. ASTM D-822 - Standard Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products.
- D. ASTM D-2240 - Standard Test Method for Rubber Property Durometer Hardness.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation. Stack flashing materials to avoid twisting, bending and abrasion. Protect materials from weather before installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 SHEET FLASHING MATERIALS

- A. Provide veneer cavity flashing system where indicated or required. Provide flashing fabric and accessories as a complete assembly unless noted otherwise.
- B. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick.
 - 1. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412.
 - 2. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).
 - 3. Tear Resistance: ASTM D 1004, 350 lbs. per linear inch.
- C. Bituminous Membrane Flashing Materials: Sheet flashing membrane, cross linked polyethylene sheet laminated to a rubber-asphalt membrane, complying with the following:
 - 1. Tensile Strength per ASTM D-412 : 21 pounds per inch width.

2. Ultimate Elongation per ASTM D-412 : 350 percent.
3. Tear Resistance per ASTM D-1004 : 350 lbs. per linear inch.

2.2 MISCELLANEOUS MATERIALS

- A. Sealing Tape: Pressure sensitive, polypropylene substrate with acrylic based adhesive, that provides permanently elastic, nonsag, nontoxic, nonstaining tape, which is compatible with flashing systems products.
- B. Fasteners: 1" diameter plastic cap, nail length (1", 1 1/2", 2") for wood frame construction, or 2" diameter plastic cap with 1 5/8" drill point self tapping screw for metal stud applications, designed to withstand designed loads.
- C. Sealants: ASTM C-920, elastomeric polymer sealant, of type, grade, class, and use classifications required to seal joints and remain watertight and are compatible with membrane product.
- D. Primer: Rubber based solvent type recommended by membrane manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Protection: Protect adjacent surfaces, fixtures and equipment from damage.
- C. Surface Preparation: Substrate must be smooth, clean, dry and free of voids, spalled areas, loose substrate, loose nails, other sharp protrusions or other matter that will hinder the adhesion or regularity of the flashing tape installation. Clean loose dust or dirt from surface wherever flashing tape is to be applied by wiping with a clean dry cloth or brush.
- D. Remove existing weather barriers, flashings, carrier or protective films and similar materials that would impede adhesion from substrates indicated to receive elasticized flexible flashing tape. Clean surfaces thoroughly prior to installation
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Seal joints as shown and as required for watertight construction.

- B. Install in accordance with manufacturer's instructions.
- C. Provide flexible flashing in the locations indicated on the Drawings.
- D. Provide Flexible flashings for concealed flashings at the following locations:
 - 1. Around windows and doors.
 - 2. Water protection on sills and heads of openings.
 - 3. Spandrel beams.
 - 4. Parapets.
 - 5. Brick masonry through wall flashings and at cavity walls.
 - 6. Provide Flexible flashings for exposed flashings at the following locations:
 - 7. Roof parapets
 - 8. Roof equipment curbs.
 - 9. Skylights.
 - 10. Vent pipes.
 - 11. Perimeter curbs.
 - 12. Expansion joints.
- E. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
 - 1. Remove mortar or other obstructions from weep holes at flashing locations.
 - 2. Extend flashing 1/4-inch beyond outside face of wall, extend through veneer, turn up 8 inches and bed into mortar joints of masonry backup.
 - 3. Carry flashing through wall and leave exposed for inspection.
 - 4. After inspection, cut flashing flush with surface of masonry.
- F. Flashing in Frame Construction: Install over solid backing, both vertically and horizontally. Secure in place with mastic; avoid puncturing installed flashing with nails or other fasteners.
- G. Miscellaneous Flashing: Lay flashing in full trowel coat of mastic, lapping joints not less than 6 inches (150 mm). Roll surface of flashing with rubber hand roller to remove all air.
- H. 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.

3.3 CLEANING AND PROTECTION

- A. Protect flashing until work is complete. Do not allow wind or other forces to displace flashing.
- B. Clean weep holes and exposed edges.

END OF SECTION 076500

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof curbs.
 - 2. Equipment supports.
 - 3. Roof hatches.
 - 4. Roof walkways.
 - 5. Preformed flashings.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Division 06 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
 - 3. Division 07 Section "Metal Roof Panels" for preformed metal roofing, ridge vents, and snow guards.
 - 4. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.

3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

D. Samples: For each type of exposed factory-applied color and finish required and for each type of roof accessory indicated.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane, base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated and mill phosphatized for field painting where required.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.
- C. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.

Exposed Finishes: High-Performance Organic Finish (2-Coat Fluoropolymer): Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.

- D. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
 - 1. Baked-Enamel Finish: Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils.
 - 2. High-Performance Organic Finish (2-Coat Fluoropolymer): Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturer's written instructions.
 - 3. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.
 - 4. Color and Gloss: As selected by Architect from manufacturer's full range.
- E. Aluminum Extrusions and Tubes: ASTM B-221, alloy and temper recommended by manufacturer for type of use.
- F. Stainless-Steel Shapes or Sheet: ASTM A-240 or ASTM A-666, Type 304 or Type 316.
- G. Steel Shapes: ASTM A-36, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.
- H. Galvanized Steel Tube: ASTM A-500, round tube, hot-dip galvanized per ASTM A-123.
- I. Galvanized Steel Pipe: ASTM A-53.

2.2 MISCELLANEOUS MATERIALS

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.
- B. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- F. Elastomeric Sealant: ASTM C-920 sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- G. Butyl Sealant: ASTM C-1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.
- H. Roofing Cement: ASTM D-4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF CURBS AND EQUIPMENT SUPPORTS

- A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with integral metal cant and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - 1. Factory install wood nailers at tops of curbs.
 - 2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 - 3. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
 - 4. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.
- B. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Thybar Corp.
2. TECO Metal Products.
3. Roof Products Inc. (RPI)

2.4 ROOF HATCHES

- A. Roof Hatches: Thermally-broken roof hatch with insulated double-wall lids and insulated curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
1. Material: Aluminum, 11 gauge, mill finish.
 2. Size: minimum 30"x42", or as indicated on drawings.
 3. Cover shall be reinforced to withstand a live load of 40 psf with a max deflection of 1/150, and 20 psf wind uplift.
 4. Hinges: Heavy-duty pintle hinges with stainless steel pins.
 5. Insulation: 3 inch polyiso in curb and cover, R-20.3.
 6. Gasket: Extruded EPDM adhesive backed acoustic gasket seal, continuous around curb and cover to assure a continuous watertight seal.
 7. Lift Spring: Gas spring with integrated damper enclosed in telescopic tubes.
 8. Hold Open Arm: Zinc plated steel automatic hold open arm locks cover in open position
 9. Latch: interior and exterior turn handles, with interior and exterior padlock hasps.
 10. Cover shall automatically lock in the open position with a rigid hold open arm.
 11. Warranty: Five (5) Years.
- B. Products: Subject to compliance with requirements, provide one of the following:
1. "Type S-50TB" by the Bilco Company.
 2. "BRHT" series by Babcock-Davis
 3. "THB-R20" by Maxam Metal Products

2.5 ANGLED SHIPS LADDER TO ROOF ACCESS HATCH

- A. Standard-duty channel rail fixed floor and wall mounted aluminum angled ship's ladder.
1. Side Stringers: Not less than 1/8 inch wall thickness by approx. 5 inches wide extruded 6005-T5 aluminum channel.
 2. Treads: Aluminum channel approx. 5 inches surface
 3. Width: 24 inches
 4. Degree of Incline: 70 degrees from floor
 5. Handrails: 1-1/4 inches Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.
 6. Unit shall withstand a 1,000 pound load without deformation or failure.
 7. Ladder Mounting Brackets: 1/4 inch thick aluminum angles for anchoring at floor and at top, to wall or opening header.
 8. Finish: Standard mill aluminum
- B. Products: Subject to compliance with requirements, provide one of the following:
1. "SL-01" by Precision Ladders

2. "H1000" by Alaco Ladder Company
3. "523" series by O'Keefes, Inc.

2.6 ACCESS HATCH SAFETY RAILING

- A. Safety railing system for roof access hatch: By same manufacturer as roof hatch, provide complete system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation, complying with OSHA 29 CFR 1910.23 & 29 CFR 1926.502 requirements.
1. Height: 42 inches above finished roof deck.
 2. Rails: Aluminum pipe, 1-1/4 inch, 1.66 inch outside diameter, schedule 40 6061 T6 alloy pipe.
 3. Fittings: Cast aluminum 5052-H32 alloy with set screw hold.
 4. Mounting Brackets: 3/16 inch zinc-plated steel or solid aluminum, with nut backing plate.
 5. Hatch rail system shall attach to the capflashing of the roof hatch and shall not penetrate any roofing material.
 6. Exit: Self-closing and latching swinging hinged gate with coil springs, 1-1/4 inch aluminum tubes.
 7. Finish: Yellow powder-coat paint.
- B. Hatch Safety Railing Warranty: All safety railing components shall be free from manufacturing defects in materials and workmanship for a period of five (5) years.

2.7 STEEP-SLOPE ATTIC EXHAUST VENT

- A. Description: Slant-back style, self-flashing, roof mounted attic exhaust vent. Provided with manufacturer's standard bird-proof construction, louvered sides seamed at top and top riveted securely to base flashing; three louvered sides open upward to prevent shingle discoloration; weather-tight collar, seamed to base flashing; large nailing flange.
- B. Net Free Area: min. 50 square inches per unit, or as indicated on drawings for ventilation calculation requirements.
- C. Screens: Manufacturer's standard aluminum mesh.

2.8 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled aluminum flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.
- B. Vent Stack Flashing: Aluminum flashing sleeve, uninsulated, with integral deck flange.

2.9 ROOF WALKWAY PADS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, compatible with roofing finish type and acceptable to membrane roofing system manufacturer.
1. Approximately 30" wide and provided in long continuous rolls.
 2. Heat-welded according to the manufacturer's instructions.
 3. Textured top surface for increased slip-resistance.
 4. Color to match the finished membrane roofing.
 5. Install in all areas exposed to repetitive or regular foot traffic, such as at roof access points, around rooftop equipment, and along paths between regular maintenance locations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof and Equipment Curb Installation: Set curb so top surface of roof curb is level.
- F. Roof Hatch Installation:
1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.

2. Attach safety railing system to roof hatch curb.
3. Attach ladder safety post according to manufacturer's written instructions.

G. Heat and Smoke Vent Installation: Locate, install, and test heat and smoke vents according to NFPA 204. Check heat and smoke vent for proper operation and unrestricted airflow. Adjust operating mechanism as required.

3.3 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 09 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A-780.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections include the following:
 - 1. Division 21 Sections specifying fire-suppression piping penetrations.
 - 2. Division 22 and 23 Sections specifying duct and piping penetrations.
 - 3. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

1.3 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- B. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems
- C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus
- D. ASTM E2837 - Standard Test Method for Determining Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies
- E. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Underwriters Laboratories Inc.
- F. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements

indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

1. Fire-resistance-rated walls including fire partitions and smoke barriers.
 2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 3. Provide systems that have been tested to show movement capability indicated.
 4. At envelope wall and floor assemblies, provide systems that have been tested to demonstrate Air Leakage L Rating indicated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
1. F-Rated Systems: Provide firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 2. T-Rated Firestop Systems: Provide firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - a. Where firestop systems protect penetrations located outside of wall cavities.
 - b. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 - c. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 - d. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
 3. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- C. For firestop system materials exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. Perimeter Fire Containment Firestopping: Use any system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.

- G. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
- H. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- I. Where 2 hour and 3 hour construction is indicated, the design system is also acceptable for use in applications of that rating and less.

1.5 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance ratings, limitations, and installation instructions for each product used.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- B. Applicator qualifications: minimum two years experience installing UL Classified firestopping materials and assemblies.
- C. Engineering Judgements: For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests shall be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestop systems.
- C. Do not cover up firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating firestop systems, under conditions of service and application, as demonstrated by firestop system manufacturer based on testing and field experience.
 - 1. Accessories: Provide components for each firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.2 FILL MATERIALS

- A. General: Provide firestop systems containing the types of fill materials required by the assembly. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.3 MIXING

- A. For those products requiring mixing before application, comply with firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.4 PRODUCTS

- A. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Hilti FS-ONE Intumescent Firestop Sealant
 - 2. Hilti CP 653 Speed Sleeve
 - 3. Hilti CP 606 Flexible Firestop Sealant
 - 4. Hilti CD 601S Elastomeric Firestop Sealant
 - 5. Hilti CP 618 Firestop Putty Stick
 - 6. Hilti CP 643N/644 Firestop Collar
 - 7. Hilti FS 657 Fire Block
 - 8. Hilti CP 680-P/M Cast-In Device

9. Hilti CP 604 Self-Leveling Firestop Sealant
10. Hilti CP 658 Firestop Plug
11. Hilti CP 637 Firestop Mortar
12. Hilti CFS-SP WB Firestop Joint Spray

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
1. The words "Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Firestop system manufacturer's name.
 6. Installer's name.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes interior and exterior joint sealants.
- B. Related Sections include the following:
 - 1. Division 03 Sections for concrete structures and substrates.
 - 2. Division 04 Sections for masonry walls and substrates.
 - 3. Division 07 Sections for exterior waterproofing, membranes, and exterior veneers.
 - 4. Division 08 Sections for glazing, and door and window openings.
 - 5. Division 09 Sections for sealants used with interior finishes.
 - 6. Division 09 Section "Acoustical Insulation" for additional sound control.

1.3 REFERENCES

- A. ASTM C-1193 - Standard Guide for Use of Joint Sealants
- B. ASTM C-919 - Standard Practice for Use of Sealants in Acoustical Applications
- C. ASTM C-920 - Standard Specification for Elastomeric Joint Sealants
- D. ASTM C-1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids
- E. ASTM C834 - Standard Specification for Latex Sealants

1.4 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.5 SUBMITTALS

- A. Product Data: Cut sheets and installation information for each joint-sealant product used.
- B. Samples for color selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements within specified warranty period.
 - 1. Warranty Period: One year minimum from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following maximum limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- D. Food Contact Suitability: Where sealants are required to be suitable for contact with food provide sealants complying with 21 CFR 177.2600.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C-920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C-920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C-1247 and qualify for the length of exposure indicated by reference to ASTM C-920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

2.3 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C-920, Type S, Grade NS, Class 100/50, for Use NT, M, A, and O.
 - 1. For above-grade exterior joints exposed to view where normal movement is anticipated; such as masonry control joints, window and door perimeters, slip joints, copings, joints in wall sheathing, etc.
 - 2. Hardness, ASTM D-2240: 15 durometer Shore A.
 - 3. Volatile Organic Compound (VOC) Content: 43 g/L maximum.
 - 4. Staining, ASTM C-1248: None on concrete, granite, limestone, and brick.

5. Color: As selected by Architect from manufacturers full line.
 6. Acceptable Products and Manufacturers:
 - a. Dow Corning: Silicone Building Sealant 795
 - b. Tremco, Inc.: Spectrem 2
 - c. Sika Corporation: Sikasil WS-290
- B. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C-920, Type S, Grade NS, Class 25/35, for Use NT.
1. For sealing interior joints at countertops, vanities, tubs, plumbing fixtures, and other locations subject to moisture.
 2. Color: White at white fixtures; clear at colored substrates.
 3. Acceptable Products:
 - a. Sikasil N Plus US by Sika USA
 - b. Dow Corning Corporation: 786 Mildew Resistant.
 - c. GE Advanced Materials: Sanitary SCS1700.
 - d. Tremco Incorporated: Tremsil 200 Sanitary.

2.4 POLYURETHANE JOINT SEALANTS

- A. Single-component, Nonsag, Exterior Grade, Polyurethane Joint Sealant: ASTM C-920, Type S, Grade NS, Class 25/35/50, for Use T, M, and O.
1. For horizontal, vertical, and overhead surface joints such as concrete and masonry walls, exterior opening perimeters siding and veneer joints, and similar conditions.
 2. Gun-grade, not textured, paintable.
 3. Acceptable Products
 - a. Master Builders: MasterSeal NP-1
 - b. Pecora Corporation; DynaTred
 - c. Sika Corporation. Sikaflex – 1a
 - d. Tremco Incorporated; Vulkem 116.
- B. Multicomponent, Traffic-Grade, Urethane Joint Sealant: ASTM C-920, Type M, Grade P or NS, Class 25/35, for Use T, I, M, or O.
1. For exterior exposed horizontal surface joints such as concrete floor and paving joints, slab/wall junctions, and similar conditions.
 2. Acceptable Products
 - a. Pecora Corporation; Urexpan NR-200.
 - b. Sika Corporation. Construction Products Division; Sikaflex – 2cSL
 - c. Tremco Incorporated; Vulkem 445SSL.

2.5 HYBRID SEALANTS

- A. Single Component, high-performance, fast-curing, low-modulus, non-yellowing sealant formulated with proprietary polymer blends: ASTM C-920, Type S, Grade NS, Class 35/50, for Use NT, M, A, and O.
1. For exterior above-grade exposed horizontal or vertical joints such as around window and door frames, at slab/wall junctions, at movement and panel joints, and similar conditions.
 2. Gun-grade, not textured, paintable.

3. Acceptable Products
 - a. MasterBuilders Solutions: MasterSeal NP-150.
 - b. Tremco: Dymonic FC
 - c. Pecora Corporation; DynaTrol I-XL Hybrid
 - d. Sika Corporation: SikaHyflex-150-LM

2.6 SECURITY SEALANTS

- A. Single-component, Nonsag, Security Grade (pick-resistant), Polyurethane Joint Sealant: ASTM C-920, Type S, Grade NS, Class 25/35/50, for Use NT, M, G, A, and O.
 1. For horizontal, vertical, and overhead surface joints at security and institutional uses requiring elasticity, abrasion and puncture resistance.
 2. Gun-grade, not textured, paintable.
 3. Acceptable Products
 - a. Master Builders: MasterSeal CR-195
 - b. Pecora Corporation; DynaFlex or Dynaflex SC
 - c. Sika Corporation. Sikaflex – 11FC
- B. Two-Component Epoxy Resin Compound: Security Grade (pick-resistant), ASTM C-881, Grade 3 Non-Sag, any Type, Class B or C.
 1. For horizontal, vertical, and overhead interior exposed surface joints at security and institutional uses to seal rigid joints and dissimilar materials with abrasion and puncture resistance.
Paste-consistency for trowel and gap-filling up to 3/4-inch.
 2. Acceptable Products
 - a. Pecora Corporation; Dynapoxy EP-1200
 - b. Sika Corporation. Sikadur -31 Hi-Mod Gel
 - c. Chemco Systems (CCS): 217 Security Sealant Paste

2.7 ACOUSTICAL SEALANTS

- A. Acoustic Sealant for Exposed and Concealed Joints and annular spaces around through-penetrations: Provide manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C-834, ASTM C-919 and the following:
 1. Sealant effectively reduces airborne sound transmission through head-of-wall and bottom-of-wall joints and openings to accommodate through-penetrations in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
 2. Acoustical Sealant to maintain STC ratings at sound rated partitions as indicated on the drawings.
 3. Sealant has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
 4. Sealant is mold and mildew resistant per ASTM G21 with a rating of zero (0), "no growth".
 5. Sealant has movement capability of minimum 12.5% in accordance with ISO 11600.
 6. Latex sealant according to ASTM C-834 class OP -18°C with shrinkage according to ASTM C-1241 < 25 % C.

2.8 PREFORMED TAPE SEALANTS

- A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C-1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for applications in which tape acts as the primary sealant.
 - 2. Type 2, for applications in which tape is used in combination with a full bead of liquid sealant.

2.9 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- B. Backer rod should be sized 25% to 50% larger than the finished joint width and be closed cell or include a “skin” that prevents bonding between the sealant and the backer rod.

2.10 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations in ASTM C-1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C-919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Sealants at Joints: Provide a minimum 3/8-inch wide sealant joint between dissimilar materials. Clear the depth of the joint to fill with sealant to at least match the width.
 - 1. Sealant joints 1/4-inch or larger are to receive closed-cell backer rod.
- H. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C-1193, unless otherwise indicated.
 - 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C-1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Interior and exterior steel doors and frames.
- B. Related Sections include:
 - 1. Division 08 Sections for Door Hardware.
 - 2. Division 08 Sections for Wood Doors.
 - 3. Division 08 Sections for Glazing.
 - 4. Division 09 Sections for Painting.
 - 5. Division 26 Sections for electrical connections, including conduit and wiring for door controls and operators.
 - 6. Division 28 Sections for security and signal devices to be integrated with hollow metal.

1.3 REFERENCES

- A. ANSI/SDI A250.8 – Recommended Specifications for Standard Steel Doors and Frames.
- B. ANSI/SDI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- C. ANSI/SDI A250.6 – Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- D. ANSI/SDI A250.10 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- E. SDI-A250.11 – Recommended Erection Instructions for Steel Frames.
- F. BHMA A156.115 – Hardware Preparation in Steel Doors and Frames.
- G. SDI-122 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
- H. NFPA 80 – Standard for Fire Doors and Fire Windows; National Fire Protection Association.
- I. NFPA 105 – Standard for the Installation of Smoke Door Assemblies.

HOLLOW METAL DOORS AND FRAMES

- J. ASTM A-1008 – Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- K. ASTM A-653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- L. ASTM A-924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- M. ASTM A-1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- N. ASTM A-153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- O. HMMA – Hollow Metal Manufacturers Association
- P. NAAMM – National Association of Architectural Metal Manufacturers

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door or window frame design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories, moldings, removable stops, and glazing.
 - 8. Details of conduit and preparations for power, signal, and control systems.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled for fire-protection ratings indicated, based on testing according to NFPA 257. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- E. Pre-Installation Conference: Conduct conference with attendance by representatives of supplier, installer, and other affected trades to review proper methods and procedures for installing hollow metal doors and frames, and to verify coordination of electrical and conduit where electrified or access control hardware is indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.9 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace doors and frames that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from an SDI Certified manufacturer:
 - 1. Ceco or Curries, Assa Abloy Group brands.
 - 2. Steelcraft or Republic, Allegion brands.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A-1008.
 - 1. Commercial Steel (CS), Type B; suitable for exposed applications.
 - 2. Provide Galvanized Steel per ASTM A-653 or ASTM A-924, with minimum G60 or A60 metallic coating.
- B. Frame Anchors: ASTM A-653, Commercial Steel (CS), Type B, with minimum G60 or A60 metallic coating.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A-153.
- D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- E. Grout: ASTM C-476, except with a maximum slump of 4 inches, as measured according to ASTM C-143.
- F. Glazing for lites: Comply with requirements in Division 08 Section "Glazing."

2.3 HOLLOW METAL DOORS

- A. General: Provide doors of designs indicated on drawings; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI A250.8 for level and model and meeting SDI A250.4 for physical performance.
 - 1. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core, as required for use and location indicated.

- a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 2. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
 3. Thickness: 1-3/4 inches minimum.
 4. Full Flush: Each door face shall be formed from a single sheet of steel with no visible seams on the faces.
- B. Exterior Doors:
1. At Industrial, Institutional and high-abuse applications: Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush), 16 ga. face sheets.
 - a. Core: Steel-stiffened with polystyrene foam.
 - b. Edge seams: Filled: edge seams are tack welded and filled smooth with structural adhesive.
 2. At Commercial, Multi-family and entrance applications: Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush), 18 ga. face sheets.
 - a. Core: Polystyrene foam
 - b. Edge seams: Filled: edge seams are tack welded and filled smooth with structural adhesive.
 3. Exterior Door Steel: Galvanized
 4. Thermal Performance: U-Factor of 0.50 maximum, R-Value of 2.0 minimum.
 5. Acoustical Performance: Minimum STC 32.
 6. Prepped for heavy-duty hardware.
- C. Interior Doors:
1. At Industrial, Institutional, Educational, and high-abuse applications: Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush), 18 ga. face sheets.
 - a. Core: Standard honeycomb
 - b. Edge seams: Standard visible: single full-height seam with mechanically interlocked edges.
 - c. Prepped for both heavy-duty hardware or standard duty hardware.
 2. At Commercial and Multi-family average-use applications: Level 1 and Physical Performance Level C (Standard Duty), Model 1 (Full Flush), 20 ga. face sheets.
 - a. Core: Standard honeycomb
 - b. Edge seams: Standard visible: single full-height seam with mechanically interlocked edges.
 - c. Prepped for standard duty hardware,
 3. Interior Door Steel: Cold-rolled at dry locations; galvanized at locations that may be subject to moisture or humidity.
- D. Hardware Reinforcement: Fabricate according to ANSI A250.6 with reinforcing plates from same material as door face sheets.

- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
 - 1. Thickness: Minimum sheet steel thickness 2 gauge thicker than face sheets of doors.
- B. Exterior Frames: Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400.
- C. Interior Frames:
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - a. Knocked-down, drywall slip-on frames are acceptable for in-place gypsum board partitions.
 - 3. Minimum 16 gauge steel with welded joints dressed and ground smooth.
 - 4. Provide rust-inhibitive primer, either air-drying or baking, suitable as base for specified finish paints.
 - 5. Standard double-rabbeted frame style unless otherwise indicated.
 - a. Provide double-egress frame profile where shown on drawings.
 - b. Provide single-rabbet frame shape at institutional or corrections applications.
- D. Hardware Reinforcement: Fabricate according to SDI A250.6 with reinforcement plates and channels, welded.
- E. Frame Face Width: 2" typical.
 - 1. 4" at head of masonry openings where required.

2.5 LABELED HOLLOW METAL FRAMES

- A. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
 - 1. The UL physical label shall be affixed to all labeled units as evidence of compliance with the procedures of the labeling agency.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick.
1. At Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. At Separate Topping Concrete Slabs and Wood Framing with Underlayment: Field-Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
1. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high maximum unless otherwise indicated.
 2. Loose Stops for Glazed Lites in Frames: Minimum 0.034 inch (22 gauge) thick, fabricated from same material as frames in which they are installed.
- B. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.047 inch (18 gauge) thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
1. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- B. Hollow Metal Frames:
1. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames may be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security screws at exterior locations.
 5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 7. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware according to ANSI A250.8 or HMMA 861.

HOLLOW METAL DOORS AND FRAMES

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI A250.6 and DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 and 28 Sections.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

- A. Prime Finish: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer,
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- C. Hollow Metal Doors:
1. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 2. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer, zinc rich primer (at exterior and galvanized openings), and finish paint.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Solid-core doors with wood-veneer faces.
- 2. Factory finishing flush wood doors.

- B. Related Sections:

- 1. Division 06 Section "Interior Finish Carpentry and Interior Architectural Woodwork"
- 2. Division 08 Section for "Hollow Metal Doors and Frames."
- 3. Division 08 Sections "Glazing" for glass view panels in flush wood doors.
- 4. Division 09 Sections "Interior Painting" and "Staining and Transparent Finishing" for field finishing doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. Finishes applied to actual door face materials, approximately 8 by 8 inch samples for each material and finish. For each wood species and transparent finish, provide set of

three samples showing typical range of color and grain to be expected in the finished work.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated," WDMA I.S.1-A, "Architectural Wood Flush Doors," and WI's "Manual of Millwork."
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons
- C. Mark each door with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 20 and 60 percent during the remainder of the construction period.

1.7 WARRANTY

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

1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
 1. Heavy Duty, typical unless otherwise indicated.
 - a. Core: Particleboard. ANSI A208.1, LD-2, 32 lbs/ft density min.
 - b. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
 2. Extra Heavy Duty: Public toilets, janitor's closets, assembly spaces, corridors and exits.
 - a. Core: Either glued wood stave or structural composite lumber.
 - b. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
 3. Standard Duty: Closets (not including janitor's closets) and private toilets.
 - a. Core: Particleboard. ANSI A208.1, LD-1, 28 lbs/ft density min.
 - b. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
 3. Pairs: Provide formed-steel edges and astragals.
 - a. Finish steel edges and astragals with baked enamel same color as doors.

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:

1. "Heritage" collection by VT Industries, Inc.
2. "Cendura" series by Masonite Architectural, a division of Mohawk.
3. Oshkosh Door Company

2.3 VENEERED-FACED DOORS:

A. Interior Solid-Core Doors with Transparent Finish:

1. Grade: AWI Custom, with Grade A faces.
2. Species: Select white birch or white oak.
3. Cut: Plain sliced (flat sliced)
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
8. Exposed Vertical and Top Edges: Same species as faces or a compatible species.
9. Thickness: 1-3/4"
10. Finish: Stain color to be selected by Architect from manufacturer's standard range.

B. Interior Solid-Core Doors with Opaque Finish:

1. Grade: AWI Custom, with Grade A faces.
2. Faces: MDO or MDF
 - a. Apply medium-density overlay to directly to high-density hardboard crossbands.
 - b. MDF: ANSI A208.2, Grade 150 or 160.
3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Thickness: 1-3/4"
5. Finish: AWI OP-4 or OP-6 finish. Color to match Architect's paint samples.

C. Interior Solid-Core Doors with High-Pressure Decorative Laminate (HPDL) Finish:

1. Faces: High-pressure decorative laminates complying with NEMA LD-3. Vertical and post formable grade laminates are not acceptable.
2. Vertical Edges: HPDL Edge Band applied after faces over Structural Composite Lumber.
 - a. Vertical Edges at Mineral Core Doors: Hardwood fire-rated stile.
3. Horizontal Edges: Structural Composite Lumber.
4. Thickness: 1-3/4"
5. Laminate color and pattern selected by Architect from manufacturer's full range.

2.4 LABELED DOORS:

- A. Fire doors shall bear labels approved by Underwriters Laboratories, Inc. Any discrepancies between the Drawings and the procedures and limitations as set forth by the testing agencies shall be brought to the architects attention. Fire doors shall bear labels approved by Underwriters Laboratories, Inc. Notify Architect immediately of any discrepancies between the drawings and the procedures and limitations as set forth by the testing agencies.

- B. Provide each fire rated door with a label permanently attached to either the hinge stile or to the top rail, showing testing agency approval for classification scheduled.
- C. Fire-Rated Door Assembly: Conform to NFPA 80 and local codes and ordinances for fire-rated class as indicated.
- D. Factory Glazing: for view panels in rated flush wood doors, provide clear fire-rated safety glazing as allowable for door rating.
- E. Mineral-Core Doors: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 1. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Lite Openings: Trim openings with moldings of material to match door, straight profile.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Sight-proof, flat slat, matching appearance and performance of door.

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime doors with one coat of wood primer specified in Division 09 Section "Interior Painting". Seal all four edges, edges of cutouts, and mortises with primer.
- B. Doors for Transparent Finish: Shop prime doors with stain or other required pretreatments, and first coat of finish as specified in Division 09 Section "Staining and Transparent Finishing." Seal all four edges, edges of cutouts, and mortises with first coat of finish.

2.7 FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory that are indicated to receive transparent finish.
- C. Field finish doors indicated to receive opaque finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 081433 - PANELED WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior and Interior Stile and Rail Wood Doors
2. Stile and Rail MDF and Wood Bifold, Bypass and Pocket Doors
3. Finishing of Stile and Rail Doors

B. Related Sections:

1. Division 06 Section "Interior Finish Carpentry and Interior Architectural Woodwork"
2. Division 08 Section for "Hollow Metal Doors and Frames."
3. Division 08 Section "Glazing" for glass view panels in flush wood doors.
4. Division 08 Section for Door Hardware
5. Division 09 Sections "Interior Painting" and "Staining and Transparent Finishing" for field finishing doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

- C. Samples for Initial Selection: Manufacturer's color charts for factory-finished doors.

- D. Samples for Verification:

1. Finishes applied to actual door face materials, approximately 8 by 8 inch samples for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.4 QUALITY ASSURANCE

- A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated," WDMA I.S.1-A, "Architectural Wood Flush Doors," and WI's "Manual of Millwork."
- B. Manufacturer : Shall be a company specializing in the manufacture of stile and rail doors specified in this section for a minimum of 10 years. All stile and rail doors specified in this section MDF, Wood and Fire doors shall be supplied and manufactured by one company. All details including panels, sticking and profiles shall match.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
 1. Store doors flat and off the floor on a level surface in a dry, well-ventilated building.
 2. Do not store on edge. Protect doors from dirt, water and abuse.
 3. Certain wood species are light sensitive. Protect doors from exposure to light (artificial or natural) after delivery.
 4. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 80 degrees Fahrenheit and 25% to 55% relative humidity.
 5. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
- B. Package doors individually in plastic bags or cardboard cartons
- C. Mark each door with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
- B. Warranty Period for Stile-and-Rail Interior Non-Rated Doors: 7 Years.
- C. Warranty Period for Stile-and-Rail Exterior and Fire-Rated Doors: 5 Years.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
1. Heavy Duty unless otherwise indicated for all commercial applications.
 2. Standard Duty for interior residential applications only.
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
 3. Pairs: Provide formed-steel edges and astragals.
 - a. Finish steel edges and astragals with baked enamel same color as doors.
- D. Prehung Doors: Provide stile and rail doors as prehung units including doors, frames, and hardware for locations indicated on plans.

1. Door Frame: Wood jambs shall be fabricated as a flat jamb with doorstop applied. Hinge jamb preparations for 1-3/4" thick doors to be machined to accept 4" hinges. Strike jamb preparations are to be machined for full lip cylindrical strike plate.
2. Door assembly that includes molded wood fiber facings, wood stiles, wood or MDF rails and particleboard core.

2.2 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.
 1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
 2. Assemble interior doors, frames, and sidelites, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Exterior Stile and Rail Wood Door Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. PL-Series by Tru-Stile Doors, a division of Marvin
 2. Exterior Stile and Rail doors by Algoma Hardwoods, a division of Masonite
 3. Exterior Stile and Rail doors by Eggers Industries, a division of VT Industries
 4. "Premier Series" by Koch & Co. Inc.
- B. Description:
 1. WDMA Design Group: Thermal (Insulated-Glass) Doors (Exterior)
 2. Veneer: Close grain hardwood
 - a. Species: Red Oak
 - b. Grade: Custom (A)
 - c. Cut: Sliced
 - d. Match: Slip
 - e. Thickness: 1/16 inch minimum.
 3. Panel sizes and types: See Drawings.
 4. Door Thickness: 1-3/4 inches.
 5. Stile Face: 6 inches standard.
 6. Top Rail and Crossrail Face: 6 inches standard.
 7. Bottom Rail Face: 10 inches minimum.
 8. Molding Pattern (Sticking): As selected by Architect from Manufacturer's full range.
 9. Finish: Stain
 10. Glass Lites: Insulating glass units, see Division 08 Section for Glazing.

- C. Door Construction for Transparent Finish: Veneered, structural composite lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces.
- D. Door Construction for Opaque Finish: Veneered, structural composite lumber.

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Door Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "TS Series" by Tru-Stile Doors, a division of Marvin
 - 2. Interior Stile and Rail doors by Algoma Hardwoods, a division of Masonite
 - 3. Interior Stile and Rail doors by Eggers Industries, a division of VT Industries
 - 4. "Imperial Series" by Koch & Co. Inc.
- B. Description:
 - 1. WDMA Design Group: Thermal (Insulated-Glass) Doors (Exterior)
 - 2. Veneer: Close grain hardwood
 - a. Species: Natural Birch
 - b. Grade: Custom (A)
 - c. Cut: Sliced
 - d. Match: Slip
 - e. Thickness: 1/16 inch minimum.
 - 3. Panel sizes and types: See Drawings.
 - 4. Door Thickness: 1-3/4 inches.
 - 5. Stile Face: 6 inches standard.
 - 6. Top Rail and Crossrail Face: 6 inches standard.
 - 7. Bottom Rail Face: 10 inches minimum.
 - 8. Molding Pattern (Sticking): As selected by Architect from Manufacturer's full range.
 - 9. Finish: Transparent Stain
 - 10. Glass Lites: Fully-tempered float glass, see Division 08 Section for Glazing.
- C. Door Construction for Transparent Finish: Veneered, structural composite lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces.
- D. Door Construction for Opaque Finish: Veneered, structural composite lumber.

2.5 FIRE RATED STILE AND RAIL WOOD DOORS

- A. Panel and Sticking types to match MDF/Wood Stile and Rail doors in every detail. Plant-ons are not acceptable.
- B. Core: for 45, 60 and 90 minute rated doors as indicated on plans; the core material shall allow panel profiles to match non rated doors.

- C. Fire doors to be Category A with concealed intumescent strips where positive pressure is required by code.
- D. Interior Fire-Rated Wood Door Frames: Frames, complete with sidelite frames and casings, fabricated from solid fire-retardant-treated wood or from veneered fire-retardant particleboard, fire-retardant medium-density fiberboard, or mineral board.
- E. Fire doors shall bear labels approved by Underwriters Laboratories, Inc. Any discrepancies between the Drawings and the procedures and limitations as set forth by the testing agencies shall be brought to the architects attention. Fire doors shall bear labels approved by Underwriters Laboratories, Inc. Notify Architect immediately of any discrepancies between the drawings and the procedures and limitations as set forth by the testing agencies.
- F. Provide each fire rated door with a label permanently attached to either the hinge stile or to the top rail, showing testing agency approval for classification scheduled.
- G. Install Fire-Rated Door Assembly: Conform to NFPA 80 and local codes and ordinances for fire-rated class as indicated.

2.6 BIFOLD, BYPASS and POCKET DOORS

- A. Bifold Doors shall match panel, sticking, profile and design of MDF/Wood Doors specified herein.
- B. All doors shall have hardwood wedge in the top rail of all door panels for improved screw holding and hardware attachment.
- C. Bifold Hardware: Manufacturer and Type: L.E. Johnson Products, Inc. Series 111FD folding door hardware set including track, hangers, hinges, pivots, knobs, brackets, screws and all other accessory items.
- D. Louver Type :
 - 1. Standard Vented typical unless otherwise noted.
 - 2. False Non-Vented where indicated.
 - 3. Louver blades to be plantation type 3/8" x 2-1/4" with 2-1/8" visible.

2.7 PANELED WOOD DOOR FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for field fitting. Factory fit doors to suit frame-opening sizes indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W Series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

- C. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Division 08 Section "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- D. Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish, and quality of construction.
- E. Exterior Doors: Factory treat exterior doors after fabrication with water-repellent preservative to comply with WDMA I.S.4. Flash top of outswinging doors with manufacturer's standard metal flashing.
- F. Shop Priming:
 - 1. Doors for Opaque Finish: Shop prime doors with one coat of wood primer. Seal all four edges, edges of cutouts, and mortises with primer.
 - 2. Doors for Transparent Finish: Shop prime doors with stain (if required), other required pretreatments, and first coat of finish as specified in Division 09 Section "Staining and Transparent Finishing." Seal all four edges, edges of cutouts, and mortises with first coat of finish.

2.8 FINISHING

- A. Finish wood doors at factory or woodworking shop where indicated in schedules or on Drawings. Wood doors that are not indicated to be factory finished may be field finished.
 - 1. Finish faces and all four edges of doors, including mortises and cutouts.
- B. Interior Transparent Finish: WI System 5 (TR-4) conversion varnish.
 - 1. Effect: Open-grain finish.
 - 2. Sheen: Satin
 - 3. Color: Match Architect's sample.
- C. Exterior Transparent Finish: WI System 11 (TR-6) catalyzed polyurethane.
 - 1. Effect: Open-grain finish.
 - 2. Sheen: Semi-Gloss or Gloss
 - 3. Color: Match Architect's sample.
- D. Opaque Finish: OP-4 conversion varnish, or OP-6 catalyzed polyurethane.
 - 1. Color as selected by Architect.
 - 2. Sheen: Semi-gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fire-rated wood door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
1. Countersink fasteners, fill surface flush, and sand smooth.
- B. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 3/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing. Replace doors that are damaged or do not comply with requirements.

END OF SECTION 081433

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings.
 - 2. Floor access doors and frames.
- B. Related Sections include the following:
 - 1. Division 07 Section "Roof Accessories" for roof hatches.
 - 2. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- D. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and notify Architect of necessary variations from access openings shown on the drawings. Obtain Architect's approval prior to changing size or locations of access doors and hatches.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
 - 3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
 - 4. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
- E. Drywall Beads: Edge trim formed from zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- F. Plaster Beads: Casing bead formed from zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.2 ALUMINUM MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
 - 1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).

- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- C. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness indicated representing specified thickness according to ANSI H35.2.
 - 1. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
 - 2. Clear Anodic Finish: AA-M32-C22-A41 (Mechanical Finish: medium satin directional textured; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 3. Baked-Enamel Finish: Apply baked enamel complying with paint manufacturer's written specifications for cleaning, conversion coating, and painting.

2.3 NON-RATED ACCESS PANELS FOR DRYWALL

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "TM Series" by J.L. Industries, Inc.
 - 2. "BNT Series" by Babcock-Davis, Inc.
 - 3. "UF-5000" by Acudor Products, Inc.
 - 4. "L-MPG" by Larsen's Manufacturing Company
- B. Non-Rated Flush Access Doors and Frames:
 - 1. Door Material: 18 gauge cold rolled steel min.
 - 2. Frame Material: 16 gauge cold rolled steel min.
 - 3. Hinge: Concealed continuous piano hinge
 - 4. Latch: Screwdriver or Allen head turning cam lock
 - 5. Finish: Gray primer or white paintable powder coat
 - 6. Size: As indicated on drawings.

2.4 FIRE-RATED ACCESS PANELS FOR DRYWALL

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "FD Series" by J.L. Industries, Inc.
 - 2. "BIT Series" by Babcock-Davis, Inc.
 - 3. "FW-5050" by Acudor Products Inc.
 - 4. "L-FRAP" by Larsen's Manufacturing Company
- B. Fire-Rated Flush Access Doors and Frames:
 - 1. Door Material: Insulated core between 20 gauge sheets
 - 2. Frame Material: 16 gauge cold rolled steel min.
 - 3. Hinge: Concealed continuous piano hinge
 - 4. Latch: Screwdriver or Allen head turning cam lock
 - 5. Finish: Gray primer or white paintable powder coat
 - 6. Size: As indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Exterior and interior factory-fabricated and pre-finished aluminum doors and window frames for field assembly and glazing.
- B. Related Sections:
1. Division 08 Sections for Door Hardware
 2. Division 08 Sections for Glazing
 3. Division 28 for electronic access control systems.

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 2. AAMA 920 - Specification for Operating Cycle Performance of Side-Hinged Exterior Door Systems.
 3. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
 4. AAMA 1503 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
- B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- C. 16 CFR 1201 (CFR Title 16, Part 1201) - Safety Standard for Architectural Glazing Materials.
- D. ASTM International:
1. ASTM C-1036 - Standard Specification for Flat Glass
 2. ASTM C-1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
 3. ASTM D-1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
 4. ASTM E-283 - Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

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5. ASTM E-330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
6. ASTM E-331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
7. ASTM E-2068 - Standard Test Method to Determine the Opening and Breakaway Forces of Sliding Windows and Doors

1.4 PERFORMANCE REQUIREMENTS

A. General Performance:

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

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

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
 - a. Basic Wind Speed: 105 mph.
 - b. Importance Factor: 1.0
 - c. Exposure Category: B

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

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2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
- F. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
 2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.
- G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E-283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- H. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E-331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbs/sq.ft.
- I. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbs/sq.ft.
- J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- K. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 41 (frame) and 63 (glass) when tested according to AAMA 1503.
- L. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.30 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.
- M. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
1. Sound Transmission Class (STC): Minimum 35 STC when tested for laboratory sound
 2. Outdoor-Indoor Transmission Class (OITC): Minimum 26 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

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- N. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
- O. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Samples: For each type of exposed finish required.
- D. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
- F. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- I. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- D. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition required by aluminum-framed systems.
- E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- G. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.
- H. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.
- I. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

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1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components.
2. Warranty Period: Two (2) years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. 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 entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide twelve (12) months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Kawneer Company
 2. EFCO Corporation.
 3. Oldcastle Building Envelope
 4. YKK AP America Inc.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308.
 5. Welding Rods and Bare Electrodes: AWS A5.10.

ALUMINUM-FRAMED STOREFRONTS

- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A-36.
 - 2. Cold-Rolled Sheet and Strip: ASTM A-1008.
 - 3. Hot-Rolled Sheet and Strip: ASTM A-1011.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken at exterior locations.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Center, where indicated on drawings, or Front/Outside set.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Sections for "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch overall thickness extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Narrow stile, 2-1/8-inch nominal width; medium stile, 3-1/2-inch nominal width; or wide stile, 5-inch nominal width.
 - a. Accessible Doors: Bottom stile to be smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: Coordinate with Division 08 Section "Door Hardware."

2.6 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware for each entrance door to comply with requirements in this Section.
 - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 - 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- B. Hinges: Full-Mortise Continuous Gear Hinges, BHMA A156.26, Grade 1.
- C. Pivot Hinges: BHMA A156.4, Grade 1.
 - 1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- D. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 - 2. Exterior Hinges: Stainless steel, with stainless-steel pin
 - 3. Quantities:
 - a. For doors up to 87 inches high, provide 3 hinges per leaf.
 - b. For doors more than 87 and up to 120 inches high, provide 4 hinges per leaf.
- E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

- F. Manual Flush Bolts: BHMA A156.16, Grade 1.
- G. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- H. Cylinders: As specified in Division 08 Section "Door Hardware."
- I. Operating Trim: BHMA A156.6.
- J. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet field conditions and requirements for opening force.
- K. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- M. Weather Stripping: Manufacturer's standard replaceable components.
- N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- O. Silencers: BHMA A156.16, Grade 1.
- P. Thresholds: BHMA A156.21, ADA compliant raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch total, 1/4" max. vertical.

2.7 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- B. Storefront manufacturer shall provide sub-sill flashing pans with sealed end dams.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

ALUMINUM-FRAMED STOREFRONTS

1. At exterior doors, provide compression weather stripping at fixed stops.
 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Color or Clear Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm min.
1. Color: as selected by Architect, match Architect's sample.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- C. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- D. Color and Gloss: As selected by Architect from manufacturer's full range.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to evaluate structural-sealant-glazed systems.
- B. Structural-Sealant-Glazed Systems: Perform quality-control procedures complying with ASTM C 1401 recommendations, including, but not limited to, system material-qualification procedures, sealant testing, and system fabrication reviews and checks.
- C. Structural-sealant-glazed system will be considered defective if it does not pass tests and inspections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
 - 1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - b. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Test and inspect representative areas to determine compliance of installed system with specified requirements.
 - 1. Test Area: Minimum of 3 sections, in locations directed by Architect.
 - 2. Air Infiltration: Areas shall be tested for air leakage of not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E-783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
 - 3. Water Penetration: Areas shall be tested according to ASTM E-1105 at minimum uniform and cyclic static-air-pressure difference of not less than 8 lbf/sq. ft. and shall not evidence water penetration.
 - 4. Water Spray Test: After the installation of typical area of storefront has been completed but before installation of interior finishes has begun, a minimum 2-bay area of system shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or repaired work with specified requirements.

3.4 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fixed and operable vinyl-framed windows.
- B. Related Sections Include:
 - 1. Division 07 Sections for Sheet Metal and Flexible Flashing and Trim
 - 2. Division 07 Sections for Air and Water Barriers and Building Wrap
 - 3. Division 07 Section for Joint Sealants

1.3 REFERENCES

- A. Window and Door Manufacturers Association (WDMA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440 – North American Fenestration Standard/ Specification for Windows, Doors, and Skylights.
- B. National Fenestration Rating Council (NFRC)
 - 1. NFRC 100; Procedure for Determining Fenestration Thermal Properties
 - 2. NFRC 200; Solar Heat Gain Coefficient and Visible Transmittance
- C. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 303 - Voluntary Specification for Polyvinyl Chloride (PVC) Exterior Profile Extrusions.
 - 2. AAMA 502 – Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
 - 3. AAMA 307 – Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
- D. ASTM International (ASTM):
 - 1. ASTM D-1929 – Standard Test Method for Determining Ignition Temperature of Plastics.
 - 2. ASTM E-330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - 3. ASTM E-1105 – Standard Test Method for Field Determination of Water Penetration of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

- E. Screen Manufacturers Association (SMA):
 - 1. SMA 1201 – Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified.
- B. Structural Performance: Provide vinyl windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
 - 1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 105 mph
 - b. Importance Factor: 1
 - c. Exposure Category: B
- C. Window Unit Water Penetration: No water penetration through window unit when tested in accordance with ASTM E 547, under static pressure of 4.5 psf (42 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.
- D. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F or less.
- E. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC Of 0.36 or less.
- F. Sound Transmission Class (STC): Provide glazed windows rated for not less than 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- G. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
 - 1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 1.57 lbf/sq. ft.
- H. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.
 - 1. Test Pressure: 15 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. or more than 15 lbf/sq. ft.
- I. Meets U.S. ENERGY STAR guidelines.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of vinyl window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 - 1. Mullion details, including reinforcement and stiffeners.
 - 2. Joinery details.
 - 3. Expansion provisions.
 - 4. Flashing and drainage details.
 - 5. Weather-stripping details.
 - 6. Glazing details.
 - 7. Window cleaning provisions.
 - 8. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of vinyl windows, and used to determine structural test pressures and design pressures from basic wind speeds indicated.
- C. Samples: For vinyl windows and components required, prepared on Samples of size indicated below.
 - 1. Main Framing Member: 12-inch-long, full-size sections of window frame with factory-applied color finish.
 - 2. Window Corner Fabrication: 12-by-12-inch-long, full-size window corner including full-size sections of window frame with factory-applied color finish, weather stripping, and glazing.
 - 3. Hardware: Full-size units with factory-applied finish.
 - 4. Weather Stripping: 12-inch-long sections.
- D. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of vinyl window. Test results based on use of downsized test units will not be accepted.
- G. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 2. Engineering Responsibility: Preparation of data for vinyl windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- C. Source Limitations: Obtain vinyl windows through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of vinyl windows. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
- F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify size of window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating fiberglass windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 DELIVERY STORAGE AND HANDLING

- A. Deliver windows materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store windows as recommended by manufacturer, off the ground and under cover.

1.9 WARRANTY

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

1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of vinyl, other materials, and finishes beyond normal weathering.
 - e. Failure of insulating glass.
2. Warranty Period:
 - a. Window: Ten (10) years from date of Substantial Completion.
 - b. Glazing: Ten (10) years from date of Substantial Completion.
 - c. Vinyl Finish: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. "1500 Series" by PlyGem, a division of Cornerstone Building Brands (Basis of Design)
 2. "Encompass" Series by Pella Corporation
 3. "Tuscany V400" Series by Milgard Windows & Doors
 4. "Premium V-4500" Series by Jeld-Wen Windows & Doors

2.2 MATERIALS

- A. Vinyl Extrusions: Rigid (unplasticized) hollow PVC extrusions, formulated and extruded for exterior applications, complying with AAMA 303.
- B. Vinyl Trim and Glazing Stops: Material and finish to match frame members.
- C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with vinyl window members, cladding, trim, hardware, anchors, and other components.
 1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or

iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

- F. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and for complete concealment when vinyl window is closed.
 - 1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
 - 2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
 - 3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- G. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.

2.3 WINDOW UNITS

- A. Furnish vinyl window units of the operational types as indicated on the Drawings, of sizes shown or scheduled.
- B. Fixed Windows: Non-operating units. No operating equipment required except for standard accessories.
- C. Single Hung Windows: Units containing one vertically-sliding sash on bottom half, and fixe sash on top half; with manufacturer's standard concealed counter balancing mechanisms, lift handle in lower rail, and latch at meeting rail.
 - 1. Manufacturer's standard mechanism for either removal of sash (without tools) or pivoting of sash to facilitate cleaning of glass entirely from inside.
- D. Integral Grids:
 - 1. Insulating glass contains non-glare grille grid between 2 panes of glass.
 - 2. Pattern as shown on drawings (9-lite, 6-lite, prairie, or other pattern.)
 - 3. Approx 7/8" contoured vinyl simulated divided lite.
 - 4. Factory finished interior and exterior to match window frames.
 - 5. Interior aluminum bars shall be adhered to both sides of insulating glass with VHB acrylic adhesive tape and cover non-glare grid.

2.4 GLAZING

- A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed fiberglass window units.

- B. Preglaze sash units. Use non-removable or removable nailed-on or snap-on type glazing stops (beads) coordinated with glass selection and glazing system indicated.
- C. Insulating Glass: Manufacturer's standard fused glass-edged or organically sealed metal edged insulating glass using either single-strength or double-strength glass as recommended by the manufacturer with a minimum 3/16 inch air space.
- D. Low E Insulating Glass: Fused glass-edged or organically sealed metal edged insulating glass using either single-strength or double-strength glass, as recommended by the manufacturer, with a minimum 3/16 inch air space and low emissivity (molecular metallic oxide) coating on exterior side of interior glass.
- E. Dual-Glazing System for Venetian Blinds: Manufacturer's standard dual-glazing system with 2 lites of clear float glass, complying with ASTM C 1036, Type I, Quality q3, glazed independently into the sash and separated by a minimum dead-air space.
- F. Glass tinting color: As selected by the Architect from the Manufacturer's full range.

2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with vinyl; designed to smoothly operate, tightly close, and securely lock vinyl windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.
 - 1. Exposed hardware finish color to be selected by Architect. Color to match vinyl frames unless otherwise noted on Drawings.
- B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Operable windows 72" above grade or more shall have a window operating control device (WOCD) complying with ASTM F2090 Standard Specification for Window Fall Prevention Devices With Emergency Escape (Egress) Release Mechanisms.

2.6 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash or ventilator.
 - 1. Screen frame color to match vinyl frames.

2.7 ACCESSORIES

- A. Flashing: As recommended by window manufacturer.

- B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.
- C. Exterior Perimeter Sealant: as recommended by window manufacturer.

2.8 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate vinyl windows that are reglazable without dismantling sash or ventilator framing.
- C. Fabricate frames and sash with mitered and fusion welded corners and joints. Trim and finish corners and welds to match adjacent surfaces.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.
 - 1. Double-Hung Windows: Provide weather stripping only at horizontal rails of operable sash.
- E. Mullions: Provide mullions and cover plates as shown, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units. Provide manufacturer's standard finish to match window units.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.
- G. Integral Finish and Color: Uniform, solid, homogeneous color interior and exterior.
 - 1. Color to be selected by Architect. White, unless otherwise noted on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 085313

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for wood and metal doors.
 - 2. Cylinders and keying for doors.
- B. Related Sections include the following:
 - 1. Division 08 Sections for Hollow Metal Doors and Frames
 - 2. Division 08 Sections for Wood Doors
 - 3. Division 08 Sections for Glass and Aluminum Entrances and Storefronts
 - 4. Division 26 and 28 Sections for Electronic and Low-Voltage devices.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - 1. Permanent cores to be installed by Owner.

1.3 REFERENCES

- A. ADA Standards for Accessible Design.
- B. ANSI A117.1 – Accessible and Usable Buildings and Facilities.
- C. NFPA 80 – Standard for Fire Doors and Other Protective Openings
- D. NFPA 101 – Life Safety Code.
- E. ANSI/BHMA Certified Product Standards, A156 Series:
 - 1. A156.1 - Standard for Butts and Hinges
 - 2. A156.2 - Bored and Preassembled Locks and Latches
 - 3. A156.3 - Exit Devices
 - 4. A156.4 - Door Controls, Closers
 - 5. A156.5 - Cylinders and input devices for locks
 - 6. A156.6 - Standard for Architectural Door Trim
 - 7. A156.7 - Template Hinge Dimensions

8. A156.8 - Door Controls - Overhead Stops and Holders
9. A156.10 - Power Operated Pedestrian Doors
10. A156.12 - Interconnected Locks
11. A156.13 - Mortise Locks and Latches
12. A156.14 - Sliding and Folding Door Hardware
13. A156.15 - Release Devices, Closer Holder, Electromagnetic and Electromechanical
14. A156.16 - Auxiliary Hardware
15. A156.17 - Self Closing Hinges and Pivots
16. A156.18 - Materials and Finishes
17. A156.19 - Power Assist and Low Energy Power Operated Swinging Doors
18. A156.21 - Thresholds
19. A156.22 - Standard for Gasketing
20. A156.23 - Electromagnetic locks
21. A156.24 - Delayed Egress Locking Systems
22. A156.25 - Electrified Locking Devices
23. A156.26 - Standard for Continuous Hinges
24. A156.28 - Recommended Practices for Mechanical Keying Systems
25. A156.29 - Exit Locks, Exit Alarms, Alarms for Exit Devices
26. A156.30 - High Security Cylinders
27. A156.31 - Electric Strikes and Frame Mounted Actuators
28. A156.36 - Auxiliary Locks
29. A156.115 - Hardware Preparation In Steel Doors and Steel Frames

F. UL 305 Standard for Panic Hardware.

G. UL 437 Standard for Safety Key Locks.

H. Door and Hardware Institute (DHI):

1. DHI Installation Guide for Doors and Hardware
2. DHI Sequence and Format for the Hardware Schedule

1.4 SUBMITTALS

- A. Product Data: Provide one set of manufacturer's catalog and technical data for each hardware item used, highlighting design, function, fasteners, accessories, and options to facilitate review with each hardware schedule submitted.
1. Coordinate submittal of door hardware with related items including metal doors and frames and electrified components to be integrated with doors.
- B. Shop Drawings: Including elevations of each door with dimensions for hardware mounting.
1. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. For electrified hardware, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring.

- C. Templates: Provide manufacturer's templating information upon receipt of approved hardware schedule to the door and frame supplier(s). Include requirements for internal reinforcements required for mounting hardware.
- D. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final as-built hardware, keying schedules, wiring diagrams, and parts lists.
- E. Warranty: Copies of manufacturer and installer warranties for products provided in this Section.
- F. Door Hardware Set Schedule: Prepared by or under the supervision of Installer or Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - 2. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, and material of each door and frame.
 - b. Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - c. Complete designations of every item required for each door or opening including model and manufacturer.
 - d. Fastenings and other pertinent information.
 - e. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - f. Explanation of abbreviations, symbols, and codes contained in schedule.
 - g. Mounting locations for door hardware.
 - h. Door and frame sizes and materials.
 - i. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - j. List of related door devices specified in other Sections for each door and frame.
- G. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in 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 sets.
- H. Keying Schedule: Prepared by or under the supervision of Installer or Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
 - 1. Conduct a meeting with Owner, Architect, and hardware supplier to determine and confirm keying requirements.
 - 2. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity and shall have a permanent office staffed with permanent employees located within a 150 mile radius of the project site. Installer's employees shall include an Architectural Hardware Consultant who shall be available during normal business hours for hardware consultation to the Owner, Architect, and Contractor.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI 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.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: 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. Latching hardware, door closers, ball-bearing hinges, and smoke seals are required for fire-rated openings, whether or not listed specifically in the door hardware schedule.
- E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system with the Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory and itemize door hardware on receipt and provide secure lock-up for door hardware delivered to Project site to protect against loss, theft and damage.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system.
- D. Deliver keys and permanent cores to Owner.

1.7 COORDINATION

- A. Templates: Distribute door hardware 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. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to door hardware already installed are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.
- C. Pre-Installation Conference: Conduct coordination conference with attendance by representatives of suppliers, installers, and subcontractors of related trades to review proper methods and the procedures for handling, organizing, and installing door hardware.
 - 1. For electrified hardware, inspect and discuss electrical rough-in, power supply connections, and other preparatory work required.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - d. Electrical component defects and failure to operate as designed.
 - 2. Warranty Period: **Seven** years from date of Substantial Completion, except as follows:
 - a. Closers: **Ten** years from date of Substantial Completion.
 - b. Exit Devices: **Three** years from date of Substantial Completion.
 - c. Electronic Components: **One** year from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
- B. Designations: Design intent, function, finish, and other distinctive qualities of each type of door hardware are indicated on the Drawings.

2.2 HINGES

- A. Butt Hinges: BHMA A156.1.
 - 1. Types and Materials: Unless otherwise noted on drawings or schedules, provide:
 - a. Hinges for Exterior Doors:
 - 1) Five-knuckle, heavy-weight, full-mortise, anti-friction plain-bearing.
 - 2) Stainless steel with stainless steel, non-removable pin
 - b. Hinges for Exterior Doors with Closers or Operators:
 - 1) Five-knuckle, heavy-weight, full mortise, ball-bearing or oil-impregnated bearing.
 - 2) Stainless steel with stainless steel, non-removable pin
 - c. Hinges for Interior Doors:
 - 1) Five-knuckle, standard weight, full-mortise, anti-friction plain-bearing.
 - 2) Steel with Steel pin, non-rising removable button-top.
 - d. Hinges for Interior Doors with Closers:
 - 1) Five-knuckle standard weight full-mortise ball-bearing or oil-impregnated bearing.
 - 2) Steel with Steel pin, non-rising removable button-top.
 - 2. Quantity: Provide the following, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches
 - b. Three Hinges: For doors with heights 61 to 90 inches
 - c. Four Hinges: For doors with heights 91 to 120 inches
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 3. Hinge Size: Unless otherwise noted on drawings or schedules, provide:
 - a. For interior doors up to 1-3/8" thick: 4" hinge height
 - b. For interior and exterior doors up to 1-3/4" thick and up to 36" wide: 4-1/2" hinge height
 - c. For doors over 36" to 42" wide: 5" hinge height
 - 4. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - a. Hospital Tips: Slope ends of hinge barrel.

- b. Safety Stud: Designed for stud in one leaf to engage hole in opposing leaf.
 - c. Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
 - d. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
- B. Continuous Geared Hinges: Aluminum hinge that extends entire length of the door leaf consisting of two pieces with interlocking gears rotating on a series of bearings, protected by a continuous cover channel. Coordinate for type, inset, and thickness of door.
- 1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include:
 - a. Model 110HD or 240HD by Architectural Builders Hardware Manufacturing, Inc.
 - b. Model 112HD or 224 HD by Ives, an Allegion brand
- C. Pivot Hinges: Mounted in openings in the floor and the top of the door frame.
- D. Fasteners: Comply with the following:
- 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Provide self-tapping screws for sweeps and stop applied weatherstripping.
 - 3. Wood Screws: For wood doors and frames.
 - 4. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - 5. Screws: Phillips flat-head; machine screws
 - 6. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. and FED-STD-795, "Uniform Federal Accessibility Standards."
- 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Trim:
- 1. Levers at exterior doors: Heavy-duty BHMA for A156.2, Series 4000, Grade 1.
 - 2. Levers at interior doors: Standard-duty BHMA for A156.2, Series 4000, Grade 2, unless otherwise noted for Grade 1 at high-use locations.
 - 3. ADA-Compliant, "L"-shaped or curved-shape return, non-handed lever design.
 - 4. Adjustable to fit door thickness.
 - 5. Non-handed and fully field reversible.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
- 1. Bored Locks: Stainless Steel or non-corrosive materials, 1/2" throw, deadlocking latchbolt on keyed and exterior functions. 3/4" throw anti-friction latch for pairs of doors.

2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 3. Deadbolts: Minimum 3/4 inch bolt throw.
- E. Backset: 2-3/4 inches standard.
- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
1. Provide dust-proof strikes for foot bolts.
 2. Provide roller-type strikes where recommended by the manufacturer of the latch and lock units.
 3. Strikes for Bored Locks and Latches: BHMA A156.2.
 4. Strikes for Mortise Locks and Latches: BHMA A156.13.
 5. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 6. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 7. Extra-Long-Lip Strikes: For use on frames with deeper thickness or applied casing trim.
 8. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 9. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include the following:
1. Best Access Systems: 9K Series
 2. Sargent 10-Line Series.
 3. Yale 5400LN Series
 4. Schlage: ND-Series
- B. Lock Functions: Function types and descriptions indicated in door hardware sets comply with the following:
1. Levers shall operate independently, and shall have inside and outside lever return springs.
 2. Outside levers on keyed locksets shall be removable only when the designated key is in the cylinder.
 3. Through-bolt mounting shall be adaptable to fit a variety of standard cylindrical lock function preps.

2.5 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
1. Compatible with Best SFIC (Small Format Interchangeable Core)
 2. Number of Pins: 6-pin

- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders, keyed into the existing Grand Master Key system with a restricted keyway.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Coordinate with Owner, and incorporate decisions made in keying conference with Owner:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
 - 3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
 - 4. Existing System: Master key or grand master key locks to be compatible with Owner's existing system.
 - 5. Keyed Alike: Key all cylinders to same change key.
- B. Key Material: Provide keys of nickel-silver only. Keys shall be stamped "Do Not Duplicate."
- C. Key Quantity: Provide 3 change keys for each lock, 6 master keys for each master system, and 6 grandmaster keys for each grandmaster system.
- D. Construction Keying: Comply with the following:
 - 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal.
 - 2. Construction Cores: Provide construction cores that are replaceable by permanent cores.
 - a. Replace construction cores with permanent cores at Substantial Completion, or as directed by Owner.
 - b. Furnish permanent cores to Owner for installation.
- E. Manufacturer: Same manufacturer as for locks and latches.

2.7 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1.
 - 1. Independent certification to 1,000,000 cycles.
 - 2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Push and return stroke shall have sound dampers.
 - 3. 3/4-inch throw deadlocking latchbolts.
 - 4. Non-handed basic device design with center case interchangeable with all functions, no extra parts required for effect of change in function. Device handing and functions must be convertible in the field.
 - 5. Releasable with 32-pound maximum pressure under 250-pound load to the door.
 - 6. Rim-type where possible.

7. No exposed bottom vertical rods (fully concealed vertical rods where possible).
8. Provide cylinder dogging (not hex dogging) on non-fire-rated devices.

B. Approved Manufacturers:

1. Von Duprin 98/99 Series
2. Precision Apex 2000 Series
3. Yale 7000 Series
4. Sargent 80 Series

C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Outside Trim: Functions and shapes indicated, material and finish to match locksets.

2.8 CLOSERS

A. Manufacturers: Subject to compliance with the following requirements, provide one of the following:

1. LCN Closers 4040XP Series
2. Stanley D-4550 Series (Best Access HD8000 Series)
3. Dorma 8900 Series
4. Yale 4400 Series

B. Surface Closers: BHMA A156.4 Grade 1. Provide type of arm required for closer to be located on interior, non-public side of door, parallel arm wherever possible, unless specifically indicated otherwise.

1. Closers are to have heavy-duty forged arms. Stamped or form break arms will not be accepted.
2. For corrosion protection, all cast iron shall be either powder coated or supplied with a special rust inhibitor coating.
3. The use of door closers with a “dead stop” on the arm bracket is prohibited. Where floor, wall, or overhead stops will not work, use “spring-cush stop” on the arm.
4. Closers shall have hydraulic fluid with a consistent velocity range of no less than 0 degrees to 100 degrees Fahrenheit to eliminate the need for seasonal adjustments.
5. On fire-rated doors, closers shall comply with UL-10C for Positive Pressure Fire Test and be U.L. listed.

- C. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- D. Hold-Open Closers must be coordinated and interface with integral smoke detector and connect to fire alarm system.
- E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.9 ELECTRONIC LOCKS

- A. General: BHMA A156.23; electrically powered, of strength and configuration appropriate to application indicated; with electromagnet attached to frame and armature plate attached to door.
 - 1. Security Grade: Activated from secure side of door by initiating device.
 - 2. Movement Grade: Activated by door movement as initiating device.
- B. Delayed-Egress Locks: BHMA A156.24; used in connection with conventional exit devices or locks causing the doors to remain locked after releasing actuation for a predetermined length of time.
 - 1. Means of Egress Doors: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds, as required by NFPA 101.
- C. Self-Contained Electronic Locks: Internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock; type and function indicated.

2.10 SLIDING DOOR HARDWARE

- A. General: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Horizontal Sliding Door Hardware: Grade 1; rated for minimum door weight of 450 lbs.
 - 2. Bypassing Sliding Door Hardware: Rated for doors weighing up to 200 lbs.
 - 3. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lbs.

2.11 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16 Grade 1.
 - 1. Provide wall stops for doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

- B. Mechanical Door Holders: BHMA A156.16.
- C. Combination Floor and Wall Stops and Holders: BHMA A156.8.
- D. Combination Overhead Stops and Holders: BHMA A156.8.
- E. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch, fabricated for drilled-in application to frame.

2.12 SEALS AND GASKETS

- A. General: Thresholds, weatherstripping, sweeps, and gasket seals to be of type and design as specified on the drawings or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where required or subject to moisture.
- B. Smoke Gasketing: At smoke-labeled openings and on metal doors in smoke- or fire-rated partitions, provide assemblies complying with NFPA 105 for smoke control ratings indicated, based on testing according to UL 1784.
- C. Fire Labeled Gasketing: At wood doors in fire-rated openings, provide intumescent assemblies complying with NFPA 80 for fire ratings indicated, based on testing according to UL-10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Thresholds for Means of Egress Doors: Comply with NFPA 101 and ADA.

2.13 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted.

2.14 FINISHES

- A. Standard: BHMA A156.18, color and texture as noted on architectural drawings.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of 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.

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, floor finish thicknesses, 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 ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.
- C. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated, unless otherwise 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Trim, cut, and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Set thresholds in bed of mastic sealant, forming tight seal between threshold and surface to which set.
- D. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner may exercise the option to engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
- B. Test electrified devices tied into fire alarm system to confirm functioning upon activation of fire alarm. Test electrified hardware and access control to verify systems operate as required in each mode of operation.

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.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

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 wraps or masking protection where necessary, and maintain conditions that ensure that 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. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Glass for windows, doors, and storefront assemblies.
 - 2. Glazing sealants and accessories.
- B. Related Sections include the following:
 - 1. Division 08 Sections for Doors with lites, sidelites, and transoms.
 - 2. Division 08 Sections for Storefronts and glass entrances.
 - 3. Division 08 Sections for Windows.

1.3 REFERENCES

- A. American Society for Testing and Materials – ASTM International:
 - 1. ASTM E-90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - 2. ASTM E-1300 – Standard Practice for Determining Load Resistance of Glass in Buildings
 - 3. ASTM C-1036 – Standard Specification for Flat Glass
 - 4. ASTM C-1048 – Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
 - 5. ASTM C-1172 – Standard Specification for Laminated Architectural Flat Glass
 - 6. ASTM C-1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
 - 7. ASTM E-2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation
- B. The Insulating Glass Manufacturers Alliance (IGMA) and The American Architectural Manufacturers Association (AAMA) merged to become The Fenestration and Glazing Industry Alliance (FGIA).

- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA's GANA Glazing Manual Publication
 - 2. IGMA Publication for Insulating Glass: TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

- D. American National Standards Institute (ANSI) / National Fenestration Rating Council (NFRC):
 - 1. ANSI/NFRC 100 - Procedure for Determining Fenestration Product U-Factors
 - 2. ANSI/NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
 - 3. ANSI/NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems
 - 4. ANSI/NFRC 400 - Procedure for Determining Fenestration Product Air Leakage
 - 5. ANSI/NFRC 500 - Procedure for Determining Fenestration Product Condensation Index Ratings

1.4 DEFINITIONS

- A. Glass Thicknesses: Indicated by thickness designations in inches or millimeters according to ASTM C-1036.

- B. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions.
 - 1. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E-1300 by a qualified professional engineer.
 - 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - 3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
 5. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E-1300.
 6. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 7. Safety Glazing: For glass panels that are accessible to pedestrians (and not protected by an 18" high obstruction) provide safety glazing, either laminated or fully tempered glass.
- C. Performance Class per AAMA/WDMA/CSA 101/I.S.2/A440: "LC" or better.

1.6 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For each type of product, in the form of 12-inch-square Samples for glass and of 12-inch-long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass: Obtain each glass type with associated glazing accessories through one source from a single manufacturer.
- C. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- D. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and 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 257.
- E. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201, "Safety Standard for Architectural Glazing Materials under the Consumer Product Safety Act" to reduce risks of injuries associated with walking, running, or falling through or against glazing materials.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
2. Glazing shall be impact tested in accordance with 16 CFR 120:
 - a. For glazing lites more than 9 sq.ft. in exposed surface area of one side, provide glazing products that comply with Category II materials
 - b. For lites 9 sq.ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials.
3. Provide safety glazing in all "hazardous" locations as defined by codes, including (but not limited to):
 - a. In fixed and operable panels of swinging, sliding, and bi-fold doors
 - b. Within 24" of the sides of doors
 - c. Where walking surfaces are within 36" of the plane of the glazing
 - d. Within 60" of the bottoms of stairs

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.10 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, within specified warranty period indicated below.
 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units

that deteriorate as defined in "Definitions" Article, within specified warranty period indicated below.

1. Warranty Period: Ten (10) years from date of Substantial Completion for non-fire-rated glazing
 2. Warranty Period: Three (3) years from date of Substantial Completion for Fire-rated glazing, minimum.
- C. Low-E and other Coated Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, within specified warranty period indicated below.
1. Warranty Period: Ten (10) years from date of Substantial Completion to be free of peeling or other deterioration of the coating.
- D. Glazing Sealants: Warrant for Ten (10) years per sealant manufacturer's standard warranty. Warranty shall certify that cured sealants:
1. Will perform as a watertight weatherseal.
 2. Will not become brittle or crack due to weathering or normal expansion and contraction of adjacent surfaces.
 3. Will not harden beyond a Shore A durometer of 50, nor soften below a durometer of 10.
 4. Will not change color when used with compatible back-up materials.
 5. Will not bleed.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C-1036, Type I (transparent flat glass), Quality-Q3; Class 1.
- B. Heat-Treated Float Glass: ASTM C-1048; Type I (transparent flat glass); Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Kind FT (Fully Tempered) float glass where safety glass is indicated, complying with ANSI Z97.1 and 16 CFR 1201 criteria.
- C. Wired Glass: ASTM C-1036, Type II (patterned and wired flat glass), Class 1 (clear), form 1 (wired and polished both sides), Quality-Q-6; and of form and mesh pattern specified.
1. Glass for fire-rated windows shall be UL listed and shall be rated for number of minutes indicated, for window assemblies when tested in accordance with NFPA 257, and as part of door assemblies when tested in accordance with NFPA 252. Wired glass shall bear an identifying UL label or the label of a nationally recognized testing agency.
 2. Wire mesh shall be polished stainless steel in a diamond pattern.
- D. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace.
1. Two panes of glass separated by a dehydrated 1/2 inch airspace, and hermetically sealed.

2. Glazed systems (including frames) shall be rated as appropriate to climate zone and as applicable to window type, and shall be tested according to NFRC 100 and NFRC 200 procedures.
3. Spacer shall be black, roll-formed, steel-reinforced butyl rubber with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners.
4. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.
5. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites.
6. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.

2.2 GLAZING

- A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 1. Guardian Glass
 2. Viracon Glass
 3. Pilkington Glass
 4. McGrory Glass
- B. Glazing for Exterior Windows:
 1. Insulating Glass Units:
 - a. 1/4 inch exterior clear float glass with Low-E coating on surface #2, fully tempered where indicated on drawings or required by codes.
 - b. 1/2 inch space; gas fill = air.
 - c. 1/4 inch interior clear float glass, fully tempered where indicated on drawings or required by codes.
 2. Performance Requirements:
 - a. U-Value (Center of Glass): 0.30 max.
 - b. Solar Heat Gain Coefficient: 0.31 max.
 - c. Visible Light Transmission: 43% min.
 - d. Shading Coefficient: 0.43 max.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene or EPDM, ASTM C-864.
 2. Silicone or Thermoplastic polyolefin rubber, ASTM C-1115.

- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C-509, Type II, black; and of profile and hardness required to maintain watertight seal:
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C-542, black.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: The sealant shall be a single or multi-component, non-acid curing, silicone sealant which meets the requirements of ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.
- H. Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the specific application.

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

3.4 FIELD TESTING

- A. Provide leak testing of glazed assemblies per AAMA 501.2 Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
 - 1. Perform testing over a minimum area of 100 sq.ft., selected by the Architect, including glazing at horizontal, vertical, and intersecting frame sections.
 - 2. Perform testing while interior walls are unfinished, and while other exterior materials that may interfere with the testing have not yet been installed, so that moisture penetration through the tested glazed assemblies will be visible.
- B. If any water penetration is evident, allow affected materials to completely dry, and then re-seal and re-test assemblies at no additional cost to the Owner, until all test areas pass with no leakage.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088300 – GLASS MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following types of silvered flat glass mirrors.
 - 1. Annealed monolithic glass mirrors.
 - 2. Film-backed, Laminated and Tempered glass mirrors qualifying as safety glazing.
- B. Related Sections include the following:
 - 1. Division 08 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
 - 2. Division 10 Section "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 DEFINITIONS

- A. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror mastic.
 - 3. Mirror hardware.

- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- C. Samples: For each type of mirror product required, in the form indicated below:
 - 1. Mirrors, 12 inches square, including edge treatment on 2 adjoining edges.
 - 2. Mirror clips.
 - 3. Mirror trim, 12 inches long.
- D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.
- E. Qualification Data: For Installer.
- F. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing paint or film and substrates on which mirrors are installed.
- G. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under NGA's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.
- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Safety Glazing Products: For film-backed, laminated or tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing paint or film and substrates on which mirrors are installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.
- C. Delivery:
 - 1. Deliver mirror to site in accordance with manufacturer's instructions.
 - 2. Deliver mirror in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer.
- D. Storage:
 - 1. Store mirror in accordance with manufacturer's instructions.
 - 2. Store mirror in clean, dry area indoors.
 - 3. Protect from exposure to direct sunlight and freezing temperatures.
 - 4. Apply temporary coverings loosely to allow adequate ventilation.
 - 5. Protect from contact with corrosive chemicals.
 - 6. Avoid placement of mirror's edge on concrete, metal, and other hard objects.
 - 7. Rest mirror on clean, cushioned pads at 1/4-points.
- E. Handling:
 - 1. Handle mirror in accordance with manufacturer's instructions.
 - 2. Protect mirror from damage during handling and installation.
 - 3. Do not slide 1 lite of mirror against another.
 - 4. Do not use sharp objects near unprotected mirror.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering mirrors that may be incorporated into the Work include, but are not limited to, the following:
1. Guardian Industries Corp.
 2. Independent Mirror Industries, Inc.
 3. Lenoir Mirror Company.

2.2 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Clear Glass Mirrors: ASTM C 1503, Mirror Select Quality.
1. Nominal Thickness: 1/8 inch
 2. Bevel: 1 inch
 3. Etching: none
 4. Edge: pencil
- B. Tempered Clear Glass Mirrors: Comply with ASTM C 1503, Mirror Glazing Quality, for blemish requirements in annealed float glass before silver coating is applied, for coating requirements, and with other requirements not affected by tempering process; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
1. Nominal Thickness: 1/8 inch
- C. Annealed Float Glass for Inner Lite of Laminated Mirrors: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.4 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
- B. Top and Bottom Mirror Clips: Chrome-look finish, metal glass clips, approximately 3/4 inch by 3/4 inch, with screws.
 1. Knappe & Vogt Manufacturing Company, model 266 Metal Glass Clip designed for appropriate thickness of mirror.
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

- A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes indicated on drawings.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment:
 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Laminated Safety Mirrors: Provide laminated mirrors fabricated to produce units complying with ASTM C 1172, Kind LM, and the following:
 1. Glass Lites: Outer lite of mirror glass with silver coating on second surface and inner lite of clear float glass.
 2. Interlayer Material: Mirror manufacturer's standard polyvinyl-butylal interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.
 3. Laminating Process: Laminate glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances, air or glass pockets, and other defects.
 4. Seal edges of laminated units to comply with written requirements of interlayer manufacturer.
- E. Film-Backed Safety Mirrors: Apply film backing with pressure-sensitive adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections. Use adhesives and film backing compatible with mirror backing paint as certified by mirror manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 - 2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. For wall-mounted mirrors, install mirrors with mirror hardware.
 - 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as indicated. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 2. For mirror hardware in the form of continuous J-channels at bottom, provide setting blocks 1/8 inch thick by 4 inches long at quarter points.
 - 3. For metal or plastic clips, place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges.
 - a. Locate clips so they are symmetrically placed and evenly spaced.
 - 4. Install mirrors with mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect installed mirror from damage during construction.
- B. Protect installed mirror from contact with contaminating substances resulting from construction operations.
- C. Remove and replace mirror that becomes broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism.
- D. Do not permit edges of mirrors to be exposed to standing water.
- E. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- F. Clean mirror promptly after installation in accordance with manufacturer's instructions.
 - 1. Remove labels from mirror surface.
 - 2. Do not use harsh cleaning materials or methods that would damage mirror.

END OF SECTION 088300

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
- B. Related Sections include the following:
 - 1. Division 05 Sections for Cold-Formed Metal Framing
 - 2. Division 06 Sections for Wood Framing
 - 3. Division 07 Sections for Fire-Resistive Joints and Penetrations
 - 4. Division 09 Sections for Gypsum Board and Ceiling Panels
 - 5. Division 09 Sections for Acoustical Joint Sealants

1.3 REFERENCES

- A. ASTM C-645 Standard Specification for Nonstructural Steel Framing Members.
- B. ASTM C-754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

1.4 SUBMITTALS

- A. Product Data: For each type of product and accessory used.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C-754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C-645 requirements for metal.
 - 2. Protective Coating: Hot-dip galvanized, unless otherwise indicated.
- B. Design Loads: As indicated on Drawings or 5 lbf/sq. ft. minimum as required by the IBC.
 - 1. Horizontal Deflection: For non-composite wall framing, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft. min.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A-641, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - 2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

3. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
- E. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C-645 with deflection limits per ASTM C-754.
 1. Protective coating: G40, or equivalent or better corrosion resistance.
- B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- C. Steel Framing Stud and Deflection Track Wall System: Self-locking steel studs with telescoping stud extension with knockout in each flange to allow for up to 1 inch of deflection for fire-rated head-of-wall deflection systems.
- D. Slip-Type Head System: Designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing up to 1-1/2-inches minimum vertical movement in non-rated assemblies.
- E. Shaftwall Framing: Provide gypsum board shaft-wall assemblies capable of withstanding the full air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.
 1. Depth: 2-1/2 inch CH-shaped studs, unless otherwise indicated or required to comply with span and deflection design criteria.
 2. Minimum Base Metal Thickness: 0.018 inches unless otherwise indicated or required to comply with span and deflection design criteria.
 3. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
- F. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch min., minimum base-steel thickness of 0.0179 inch, and depth required to fit insulation thicknesses indicated.

2.4 RESILIENT SOUND ISOLATION CLIPS

- A. Resilient Sound Clip System, General: Assembly designed to decouple the interior gypsum board or other sheet goods finish from the structure, to decrease noise and vibration transmission.
- B. Clips: Manufactured galvanized- or aluminum-zinc-coated steel shape with rubber isolator.

1. Use fasteners and hat channels as recommended by the clip manufacturer for optimum results and appropriate to the loads supported and spacing of attachments.
- C. Products that may be used in the Work include:
 1. RSIC-1 clips from PAC International, LLC (Basis of Design)
 2. GenieClip by Pliteq, Inc.
 3. Resilmount A237R by Studco Building Systems

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip Walls Tracks:
 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C-754, except comply with framing sizes and spacing indicated.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C-840 that apply to framing installation.

- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Do not attach hangers to steel roof deck.
 - 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.

- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or bracing above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

END OF SECTION 092216

SECTION 092900 - GYP SUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum-based interior and exterior wall and ceiling panels.
- B. Related Sections include the following:
 - 1. Division 05 Sections for Metal Framing
 - 2. Division 06 Sections for Rough Carpentry, Sheathing, and Wood Trusses
 - 3. Division 07 Sections for Exterior Weatherproofing and envelope products
 - 4. Division 09 Section Non-Structural Metal Framing for channels, ties, and clips
 - 5. Division 09 Sections for Acoustical Insulation and Joint Sealants
 - 6. Division 09 Sections for Painting and other finishes.

1.3 REFERENCE STANDARDS

- A. ASTM C1396 – Standard Specification for Gypsum Board.
- B. ASTM C1629 – Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- C. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board, for methods and materials for use in conforming to specific assembly details.
- D. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base, for accessories used in conjunction with assemblies of gypsum wallboard and gypsum veneer base to protect edges and corners and to provide architectural features.
- E. ASTM C1278 – Standard Specification for Fiber-Reinforced Gypsum Panels, for physical properties, dimensions and tolerances, and edges of various types of interior fiber-reinforced gypsum panels..

1.4 SUBMITTALS

- A. Product Data: Cut sheets for each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 8-inch long length for each trim accessory indicated.
2. Factory-Applied Textured Finishes: 8-inch-square sample for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assemblies indicated according to UL 263 / ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assemblies indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

1.6 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Georgia-Pacific Gypsum LLC.
 2. National Gypsum Company.
 3. USG Corporation.

4. Certainteed Gypsum Inc.

2.3 INTERIOR GYP SUM BOARD

- A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.
- B. Regular Interior Type: Gypsum core panel with paper sheathing both sides.
 1. Thickness: 5/8 inch or as noted on drawings.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Fire-Resistant: Gypsum core panel specially formulated for use in fire-resistive assemblies.
 1. Type X for most fire-resistive applications
 2. Type C where required for certain fire-resistive assemblies indicated on drawings.
 3. Thickness: 5/8 inch typical minimum, or as noted on drawings.
 4. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Ceiling Type: Gypsum core panels manufactured to have more sag resistance than regular-type gypsum board.
 1. Thickness: 5/8 inch minimum or as noted on drawings.
 2. Long Edges: Tapered.
- E. Flexible: Gypsum panels designed to bend to form curved surfaces and arches.
 1. Thickness: 1/4 inch.
 2. Paper faced on one side, only for use in non-rated applications.
 3. Long Edges: Eased or Tapered.
- F. Abuse-Resistant: Denser gypsum core reinforced with glass fibers, with fiberglass coating both sides, manufactured to produce greater resistance to surface indentation and abrasion, with the following characteristics per ASTM C-1629:
 1. Soft-Body Impact resistance: Level 2 or better
 2. Hard-Body Impact resistance: Level 1 or better
- G. Impact-Resistant: Denser gypsum core reinforced with embedded fiberglass mesh, coated with fiberglass mats both sides, manufactured to produce greater resistance to surface indentation and abrasion, with the following characteristics per ASTM C-1629:
 1. Soft-Body Impact resistance: Level 3 minimum
 2. Hard-Body Impact resistance: Level 2 or better
- H. Moisture- and Mold-Resistant: Fiberglass-mat facer coatings on both sides of a moisture-resistance treated gypsum core.
 1. Application: Bathroom and toilet room walls and ceilings; at backsplash walls behind base and upper cabinets at sink areas; and other similar locations prone to moisture exposure.
- I. Shaft Liner Board: Non-combustible gypsum core treated to be moisture-resistant, with fiberglass facer on both sides, specially designed for use in shaftwall assembly designs.

1. 1" thick panels designed to be friction-fit within special steel shaft wall studs and tracks that will meet designated fire-resistive assembly requirements.

2.4 EXTERIOR GYPSUM BOARD

- A. Regular Exterior Soffit Board: Gypsum core soffit panel with glass-fiber reinforced sag resistant and moisture-resistant core treatments, and water-resistant facings for exterior use.
- B. See Division 06 Sections for gypsum-based board products used for exterior structural wall sheathing, and Division 07 sections for gypsum-based board products used for exterior envelope weatherproofing applications.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9.
 1. Thickness: 5/8 inch nominal min.
 2. Composition: Portland cement and sand with selected additives.
 - a. No formaldehyde, no gypsum, and no paper facing or abrasive aggregates.
 3. Application: At thick-set or mortar-bed tile areas, and behind exterior tile and adhered stone veneers.
- B. Gypsum-based Backer Board: Gypsum-based panels manufactured with water- and mold-resistant additives, with waterproof fiberglass surface coatings on both sides.
 1. Thickness: 1/2" or 5/8" to match adjacent drywall panels, or 1/4" laminated/adhered over drywall or plywood backup panels.
 2. No paper facings, free of resins or solvents.
 3. Specifically designed to be used as backer for thin-set tile wall applications.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047. Extruded accessories of profiles and dimensions required.
 1. Material: Galvanized or aluminum-coated steel sheet, aluminum, rolled zinc, stainless steel, or plastic.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
 3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 4. Finish: Corrosion-resistant, compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Cross-fiber paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 2-inch self-adhering fiberglass mesh.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats, and appropriate for tape application, spotting of fasteners, drywall trim, and complete joint finishing and sanding.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) as specified in Divisions 09.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- F. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Regular Type: Vertical surfaces, unless otherwise indicated.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling and soffit surfaces.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels to minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at all outside corners.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
 - 1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
 - 2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- B. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to GA-214 and ASTM C-840:
 - 1. Level 2: Joints shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound. Fastener heads and accessories shall be covered with one coat of joint compound. Surface shall be free of excess joint compound. Tool marks are acceptable.
 - a. At concealed locations only, such as above finished ceilings and in attics.
 - 2. Level 3: Joints and shall have tape embedded in joint compound and shall be wiped with a joint knife leaving a thin coating of joint compound over all joints. One additional coat of joint compound shall be applied over all joints. Fastener heads and accessories shall be covered with two separate coats of joint compound. The surface shall be smooth and free of tool marks.
 - a. At surfaces to receive heavy-texture finishes or textured spray finishes.
 - 3. Level 4: Joints shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. The surface shall be smooth and free of tool marks.

- a. Typical at all walls to receive paint or sheet wallcoverings, unless otherwise noted.
4. Level 5: Joints shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin consistent coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. An additional skim coat of joint compound or a material manufactured especially for this purpose shall be applied to the entire surface. The surface shall be very smooth and free of tool marks.
 - a. Where indicated by Architect for dark paint colors and glossy colors.

3.6 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Ceramic and Porcelain tile.
2. Thresholds installed as part of tile installations.
3. Waterproof membrane for tile installations.
4. Crack-suppression membrane for thin-set tile installations.
5. Cementitious backer units installed as part of tile installations.
6. Metal edge strips installed as part of tile installations.

- B. Related Sections include the following:

1. Division 02 Sections for selective demolition of existing finishes.
2. Division 07 Sections for waterproofing under thickset mortar beds.
3. Division 07 Sections for Joint Sealants
4. Division 09 Section "Gypsum Board" for cementitious backer units, glass-mat, water-resistant backer board.
5. Division 22 Sections for floor drains.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.4 REFERENCES

- A. American National Standards Institute (ANSI):
1. A137.1 – Standard Specification for Ceramic Tile
 2. A137.3 – Specifications For Gauged Porcelain Tile And Gauged Porcelain Tile Panels/Slabs (Material And Installation Standards) – applicable to tiles 1 square meter or larger.
 3. A118/A136.1 – Specification for the Installation of Ceramic Tile:

- a. A108.01 General Requirements: Subsurfaces and Preparations by Other Trades
 - b. A108.02 General Requirements: Materials, Environmental, and Workmanship
 - c. A108.1A Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar
 - d. A108.4 Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive
 - e. A108.5 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
 - f. A108.6 Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy
 - g. A108.8 Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
 - h. A108.9 Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout
 - i. A108.10 Installation of Grout in Tilework
 - j. A108.11 Interior Installation of Cementitious Backer Units
 - k. A108.13 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone
 - l. A108.17 Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone
 - m. A108.19 Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar
 - n. A108.20 Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs
4. A118/A136.1 – Materials Specifications for Ceramic Tile:
- a. A118.1 Specifications for Dry-Set Cement Mortar
 - b. A118.3 Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
 - c. A118.4 Specifications for Modified Dry-Set Cement Mortar
 - d. A118.6 Specifications for Standard Cement Grouts for Tile Installation
 - e. A118.7 Specifications for High Performance Cement Grouts for Tile Installation
 - f. A118.8 Specifications for Modified Epoxy Emulsion Mortar/Grout
 - g. A118.10 Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation
 - h. A118.12 Specification for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations
 - i. A118.15 Specifications for Improved Modified Dry-Set Cement Mortar
 - j. A118.16 Specifications for Flowable Hydraulic Cement Underlayment/Self-Leveling Underlayment
5. A326.3 American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials
- B. Tile Council of North America, Inc. (TCNA) Handbook.

1.5 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Step Treads: Minimum 0.6.
 - 3. Ramp Surfaces: Minimum 0.8.

- B. Water Absorption:
 - 1. Vitreous (High Density): Water absorption of tile between 0.5% and 3.0%, for use only at interior areas rarely exposed to minor amounts of moisture.
 - 2. Impervious (Extremely dense): Water absorption of tile 0.5% or less, at all areas unless otherwise noted.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Stone thresholds in 6-inch lengths.
 - 5. Metal edge strips in 6-inch lengths.

1.7 QUALITY ASSURANCE

- A. In addition to complying with all applicable codes and regulations, comply with the following:
 - 1. "Handbook for Ceramic Tile Installation" (latest edition) as published by the Tile Council of America, Inc.
 - 2. "Recommended Standard Specifications for Ceramic Tile" as published by the Tile Council of America, Inc.
 - 3. American National Standards Institute (ANSI) publications as applicable.
 - 4. American Society for Testing and Materials (ASTM) publications as applicable.

- B. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
 - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproofing.
 - 3. Joint sealants.
 - 4. Cementitious backer units.
 - 5. Metal edge strips.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified clearly with labels describing contents.
 - 1. Furnish at least one extra box of tile for each type, composition, color, pattern, and size of item indicated.
 - a. Provide a minimum of 4 full tiles for tiles 12"x12" or larger
 - b. Provide a minimum of 8 full tiles for tiles 10" or smaller.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
 - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- 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. As selected by Architect from manufacturer's full range.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

- A. Ceramic Tile:
 - 1. Composition: Thin slabs of red or white clay, in the form of shale, gypsum or sand mixed with minerals and water, fired at average temperatures of averaging temperatures of 2,000 degrees Fahrenheit.
 - 2. Hardness and wear: suitable for residential use or light commercial only.
 - 3. Glazing: Porcelain Enamel Institute (PEI) rating minimum of 3.
 - 4. Finish: Matte or Polished, as selected by Architect.
- B. Porcelain Tile:
 - 1. Composition: Slabs of clay mixed with feldspar and sand, fired at average temperatures of averaging temperatures of 2,300 degrees Fahrenheit.
 - 2. Impervious, water absorption of less than 0.5%.
 - 3. Hardness and wear: suitable for all uses including exterior exposure.
 - 4. When Glazing is indicated: Porcelain Enamel Institute (PEI) rating of 5.
 - 5. Finish: Matte or Polished, as selected by Architect.
 - a. Rectified edges: ground after firing for more uniform, exact dimensions.
- C. Ceramic Mosaic Tile:
 - 1. Composition: Vitreous or impervious natural clay or porcelain.
 - 2. Module Size and shape: As selected by Architect.

3. Finish: Glazed or Unglazed, Matte or Polished, as selected by Architect.
4. Mounting: Factory back-mounted.

- D. Glazed Wall Tile Trim Units: Matching characteristics of adjoining tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes selected from manufacturer's standard shapes.
- E. Ceramic Mosaic Trim Units: Matching characteristics of adjoining tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes selected from manufacturer's standard shapes.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/4 inch or less, and finish bevel to match face of threshold.
- B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.
- C. Solid Polymer Thresholds: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without precoated finish.
- D. Aluminum Thresholds: Anodized aluminum profile with textured, sloped exposed surface, tapered leading edge, and integrated grout joint spacer.

2.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

- A. General: Product that complies with ANSI A118.10.
- B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and fabric reinforcement.
- C. Unreinforced, Fluid-Applied Product: Liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in a consistency suitable for trowel application and intended for use as waterproofing.
- D. Latex-Portland Cement Product: Flexible mortar consisting of cement-based mix and acrylic-latex additive.
- E. Urethane Waterproofing and Tile-Setting Adhesive: One-part liquid-applied urethane in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a two-step process.

2.5 SETTING AND GROUTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A and as specified below:
1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
 4. Latex Additive: Acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
1. For wall applications, provide nonsagging mortar that complies with Paragraph C-4.6.1 in addition to the other requirements in ANSI A118.1.
- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 2. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.
 - a. For wall applications, provide nonsagging mortar that complies with ANSI A118.4.
- D. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3
- E. Organic Adhesive: ANSI A136.1, Type I
- F. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- G. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.
- H. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.
- I. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.
1. Polymer Type: Ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients.
 2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
 3. Polymer Type: Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
 - a. Unsanded grout mixture for joints 1/8 inch and narrower.
 - b. Sanded grout mixture for joints 1/8 inch and wider.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
- D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
- E. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout. Include primer and backer rod recommended by manufacturer.

2.7 TILE BACKER UNITS

- A. Cementitious Backer Units: ANSI A118.9.
 - 1. Thickness: 5/8 inch nominal min.
 - 2. Composition: Portland cement and sand with selected additives.
 - a. No formaldehyde, no gypsum, and no paper facing or abrasive aggregates.
 - 3. Application: At thick-set or mortar-bed tile areas, and behind exterior tile and adhered stone veneers.
- B. Gypsum-based Backer Board: Gypsum-based panels manufactured with water- and mold-resistant additives, with waterproof fiberglass surface coatings on both sides.
 - 1. Thickness: 1/2" or 5/8" to match adjacent drywall panels, or 1/4" laminated/adhered over drywall or plywood backup panels.
 - 2. No paper facings, free of resins or solvents.
 - 3. Specifically designed to be used as backer for thin-set tile wall applications.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, exposed-edge material.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard product for waterproofing grout joints that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

- B. Verify that concrete substrates for tile floors installed with adhesives or thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.

H. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
3. For chemical-resistant furan grouts, comply with ANSI A108.8.

I. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
- B. Joint Widths: Install tile on floors with the following joint widths:
 1. Ceramic Mosaic Tile: 1/16 inch.
 2. Other Ceramic Tile: 1/8 inch.
 3. Quarry Tile: 1/4 inch.
 4. Paver Tile: 3/8 inch.
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- D. Metal Edge Strips: Install at locations indicated.
- E. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.6 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
 - 2. Glazed Wall Tile: 1/8 inch .

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 093000

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient moulding accessories.
 - 3. Resilient stair treads and accessories.
- B. Related Sections:
 - 1. Other Division 09 Sections for adjacent flooring materials and wall finish materials.

1.3 SUBMITTALS

- A. Product Data: Cut sheets and installation data for each type of product indicated.
- B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 8 inches long, of each resilient product color, texture, and pattern required.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 60 degrees or more than 90 degrees, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. After installation and until Substantial Completion.

- B. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset) preferred basis-of-design, or Type TP (rubber, thermoplastic)
 - 2. Manufacturing Method: Group I (solid, homogeneous)
 - 3. Style: Cove (base with toe)
- B. Resilient Base, General:
 - 1. Minimum Thickness: 0.125 inch (1/8") min.
 - 2. Lengths: Coils in manufacturer's standard length.
 - 3. Color and Finish: As selected by Architect from manufacturer's full range.
- C. Standard Flat Coved Wall Base:
 - 1. Height: 4 inches min. or 6" where indicated on Drawings.
 - 2. Subject to requirements, products include:
 - a. "BurkeBase Type TS" by Mannington Commercial
 - b. "Pinnacle" rubber base by Roppe Corp.
 - c. "Base 2000" by Flexco Corp.
 - d. "Traditional Duracove" by Tarkett USA
- D. Profiled /Sculpted Wall Base:
 - 1. Height: 6 inches min.
 - 2. Subject to requirements, products include:
 - a. "Millwork" by Tarkett USA
 - b. "Edge Effects" by Mannington Commercial
 - c. "Pinnacle Plus" rubber base by Roppe Corp.
 - d. "Base Sculptures" by Flexco Corp.

2.2 RESILIENT STAIR ACCESSORIES

- A. Resilient Stair Treads Standard: ASTM F-2169.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
 - 2. Manufacturing Method: Group 1, tread with embedded abrasive strips.
- B. Characteristics:
 - 1. Size: Lengths and depths to fit each stair tread and riser in one piece.
 - 2. Surface Design: Class 2, raised design pattern of round disks or diamond-shapes, as selected by Architect.

3. Risers: Smooth, same material as treads, integral formed one piece with tread.
 4. Colors and Patterns: Solid color, as selected by Architect.
 5. Abrasive Nosing Strip: Approx. 2-inch wide, full width of tread, non-slip safety texture. Contrasting color as selected by Architect.
- C. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
1. Distinct Designs Heavy Duty by Flexco Corp.
 2. Burke Collection by Mannington Commercial
 3. Johnsonite Rubber by Tarkett USA

2.3 RESILIENT MOLDING ACCESSORY

- A. Provide Resilient Molding Accessories as indicated on Drawings and where necessary for finished edges of project conditions:
1. Cap for cove carpet
 2. Cap for cove resilient floor covering
 3. Carpet bar for tackless installations
 4. Carpet edge for glue-down applications
 5. Nosing for carpet
 6. Nosing for resilient floor covering
 7. Reducer strip for resilient floor covering
 8. Joiner for tile and carpet
 9. Transition strips
- B. Material: Rubber to match adjacent materials..

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Solid vinyl floor tile.
- B. Related Sections:
 - 1. Division 09 Sections for Resilient Base and Accessories
 - 2. Other Division 09 Sections for adjacent flooring materials.

1.3 REFERENCES

- A. ASTM F-710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- B. ASTM F-1482 Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
- C. ASTM F-1700 Standard Specification for Solid Vinyl Tile
- D. ASTM F-1913 Sheet Vinyl Floor Covering without Backing
- E. ASTM F-1303 Sheet Vinyl Floor Covering with Backing
- F. ASTM F-1066 Standard Specification for Vinyl Composition Floor Tile

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including coefficient of friction data and installation instructions.
- B. Shop Drawings: Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

- D. Seam Samples: For seamless-installation techniques, with seam running lengthwise and in center of a 9-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: Use same designations indicated on Drawings.
- F. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- G. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 85 deg F. Store floor tiles on flat surfaces.
 - 1. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. After installation and until Substantial Completion.
- B. Close spaces to traffic during floor tile installation, and for 48 hours after floor tile installation.
- C. Install floor tile after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish materials equal to a minimum of **1** percent of amount installed, for each type, composition, color, pattern, and size of item indicated.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE

- A. General: Consisting of a tough, clear, rigid vinyl wear layer protecting a high-resolution print layer on a solid vinyl backing. The wear surface is embossed with different textures, protected by a UV-cured polyurethane finish. Resistant to cleaning agents and light.
- B. Tile Standard: ASTM F-1700, Class I, Type A, monolithic.
 1. Edge Treatment: Square.
 2. Sizes: Plank or Tile, as selected by Architect from manufacturer's full range.
- C. Commercial-Grade Luxury Vinyl Tile (LVT) for Glue-Down Installation:
 1. Tile total thickness: 1/8-inch, or 3.0 mm (minimum)
 2. Wear layer thickness: 20 mil (minimum)
 3. Limited Commercial Warranty: 20 years
- D. Commercial-Grade Luxury Vinyl Tile (LVT) for Floating or Loose-Lay Installation:
 1. Tile total thickness: 5.0 mm (minimum)
 2. Wear layer thickness: 20 mil (minimum)
 3. Limited Commercial Warranty: 10 years

2.2 VINYL COMPOSITION FLOOR TILE

- A. General: Consisting of vinyl fillers, pigments, and the binder shall consist of one or more resins of poly(vinyl chloride) or vinyl chloride copolymers or both compounded with suitable plasticizers.
- B. Product: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 1. "Excelon" by Armstrong World Industries
 2. "Alternatives" by the Congoleum Corporation
 3. "IQ Granite SD" by Tarkett USA
- C. Tile Standard: ASTM F 1066 either Class 1 solid-color tile or Class 2 through-pattern.
 1. Wearing Surface: Smooth.
 2. Size: 12 by 12 inches
- D. Colors and Patterns: As selected by Architect from full range of available colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor tile.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer or as required by Owner. Proceed with installation only after substrates pass testing.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on floor covering surfaces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096523 – RUBBER FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubber tile flooring
 - 2. Rubber sheet flooring
 - 3. Rubber sports/gym flooring.
- B. Related Sections:
 - 1. Division 09 Sections for Resilient Base and Accessories
 - 2. Other Division 09 Sections for adjacent flooring materials.

1.3 REFERENCES

- A. ASTM F-710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- B. ASTM F-1482 Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
- C. ASTM F-1344 Standard Specification for Rubber Floor Tile
- D. ASTM F-1859 Standard Specification for Rubber Sheet Floor Covering Without Backing
- E. ASTM F-3041 Standard Specification for Bonded Rubber Crumb Floor Coverings
- F. ASTM F-970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading
- G. ASTM F-2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems
- H. ASTM E-648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including coefficient of friction data and installation instructions.
- B. Shop Drawings: Include floor tile layouts, edges, seaming, around columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns and color combinations.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Seam Samples: For seamless-installation techniques, with seam running lengthwise and in center of a 9-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: Use same designations indicated on Drawings.
- F. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- G. Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 85 deg F. Store floor tiles on flat surfaces.
 - 1. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 85 deg F in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
 2. During installation.
 3. After installation and until Substantial Completion.
- B. Close spaces to traffic during floor tile installation and for 48 hours after floor tile installation.
- C. Install floor tile after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish materials equal to a minimum of 5 percent of amount installed, for each type, composition, color, pattern, and size of item indicated.

PART 2 - PRODUCTS

2.1 RUBBER TILE FLOORING

- A. General: Thermoset rubber tile containing primarily recycled content.
- B. ASTM F-1344, Class IA, homogeneous rubber tile, solid color.
1. Thickness: 1/8 inch (3.175 mm) minimum.
 2. Edge profile: Square
 3. Hardness: Not less than 85 per ASTM D-2240.
 4. Static Coefficient of Friction: not less than 0.50 per ASTM D-2047
 5. Wearing Surface: Smooth, unless pattern is indicated on Drawings.
 6. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Norament" by Nora Systems, a division of Interface
 - b. "ColorScape" or "ColorSpec" by Mannington Commercial
 - c. Standard Rubber Tile by Roppe Corporation
 - d. Johnsonite Solid Color Rubber Tile by Tarkett USA
 - e. "Flextones" or "SpexTones" by Flexco, Inc.
- C. ASTM F-1344, Class IB, homogeneous rubber tile, mixed color.
1. Thickness: 1/8 inch (3.175 mm) minimum.
 2. Edge profile: Square
 3. Hardness: Not less than 85 per ASTM D-2240.
 4. Static Coefficient of Friction: not less than 0.50 per ASTM D-2047
 5. Wearing Surface: Smooth, unless pattern is indicated on Drawings.
 6. Product: Subject to compliance with requirements, provide one of the following:
 - a. "Norament xp" by Nora Systems, a division of Interface
 - b. "ColorFields" by Mannington Commercial
 - c. "Fiesta" or "Renew" by Roppe Corporation
 - d. "Color Splash" by Tarkett USA

- D. Sizes and colors:
 - 1. Tile Size: 24"x24" up to 27"x27" or as otherwise indicated on Drawings.
 - 2. Colors and Patterns: As selected by Architect from full range of available colors.

2.2 RUBBER SHEET FLOORING

- A. General: Thermoset rubber sheet flooring without backing containing primarily recycled content.
- B. ASTM F-1859, Type I homogenous sheet
 - 1. Thickness: 0.10 inch (2.5 mm) minimum.
 - 2. Hardness: Not less than 85 per ASTM D-2240.
 - 3. Static Coefficient of Friction: not less than 0.50 per ASTM D-2047
 - 4. Wearing Surface: Smooth, unless pattern is indicated on Drawings.
- C. Product: Subject to compliance with requirements, provide one of the following:
 - 1. "Noraplan" by Nora Systems, a division of Interface
 - 2. "ColorFields" by Mannington Commercial
 - 3. "Envire" Rubber Sheet by Roppe Corporation
- D. Sizes and colors:
 - 1. Sheet Rolls: 4 to 6 feet wide x up to 50 feet length
 - 2. Colors and Patterns: As selected by Architect from full range of available colors.

2.3 RUBBER GYM FLOORING

- A. General: Bonded rubber crumb sheet flooring without backing containing primarily recycled content and EPDM chips.
- B. ASTM F-3041, available in Type I sheet or Type II tile.
 - 1. Thickness: 3/8 inch minimum.
 - 2. Hardness: Not less than 85 per ASTM D-2240.
 - 3. Static Coefficient of Friction: not less than 0.50 per ASTM D-2047
 - 4. Wearing Surface: Smooth, unless pattern is indicated on Drawings.
- C. Product: Subject to compliance with requirements, provide one of the following:
 - 1. "Prime Sports" Floor Recycled Rubber, by Flexco Inc.
 - 2. "Eco-Tuff" by Horner Sports Flooring
 - 3. "Sport-Fleck" or "Style-Fleck" by Amarco Products
 - 4. "Recoil" Fitness Flooring by Roppe Corporation
- D. Sizes and installation:
 - 1. Adhesive installed square edge tile size: 24"x24" min.
 - 2. Floating (no adhesive) installed interlocking shape edge tiles: 34"x34" min.
 - 3. Adhesive installed sheet rolls: 4 to 6 feet wide x up to 50 feet length
 - 4. Colors and Patterns: Black base with colored chip options, as selected by Architect from full range of available combinations.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Type recommended by manufacturer to suit flooring and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor tile.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F-710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer or as required by Owner. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean to remove all dust from substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out flooring seams from center marks established with principal walls, discounting minor offsets, so product widths at opposite edges of room are equal. Adjust as necessary to avoid using cut widths that equal less than one-half width at perimeter.
- C. Match flooring for color and pattern by selecting from cartons or rolls in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed products.
- D. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend flooring into toe spaces, door reveals, closets, and similar openings. Extend flooring to center of door openings.
- F. Install flooring pieces on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining surfaces. Tightly adhere edges to substrates that abut covers and to cover perimeters.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile. Remove adhesive and other blemishes from exposed surfaces.
- B. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. No traffic for 24 hours after installation.
 - 2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- C. Cover and protect flooring from surface traffic until Substantial Completion.

END OF SECTION 096523

SECTION 096800 - CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Modular carpet.
 2. Broadloom carpet.
- B. Related Sections include the following:
1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 2. Carpet Cushion: For each type indicated. Include manufacturer's written data on physical characteristics and durability.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet: 24-inch-square Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.
 3. Carpet Cushion: 12-inch-square Sample.
 4. Carpet Seam: 12-inch Sample.
 5. Mitered Carpet Border Seam: 12-inch-square Sample. Show carpet pattern alignment.
- C. Sustainability Data:
1. Submit product data or manufacturer's certification letter indicating percentages by weight of pre-consumer and post-consumer recycled content for each carpet product.
 2. Submit product data, MSDS, or manufacturer's certification letter indicating volatile organic compound (VOC) content for each adhesive used for installation of carpet, cove base, and carpet edge guard products.

3. Submit manufacturer's documentation that cove base and carpet edge guard products are compliant with one or more of the following:
 - a. FloorScore IAQ Certification Program
 - b. GreenGuard Certification Program
 - c. CRI IAQ Green Label Plus Program.
- D. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods that may be detrimental to finishes and performance.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet and carpet cushion until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 WARRANTY

- A. Special Warranty for Broadloom Carpet and Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.

3. Warranty Period: **10** years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.
1. Warranty includes consequent removal and replacement of carpet and accessories.
 2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
 3. Failure includes, but is not limited to, permanent indentation or compression.
 4. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Broadloom Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.
 2. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
1. Mohawk, Lees, Bigelow, and Karastan – divisions of the Mohawk Group.
 2. Mannington Commercial – a division of Mannington Mills, Inc.
 3. Tarkett USA.
 4. Shaw Contract Commercial Flooring.
 5. Milliken & Company
 6. Interface Inc.

2.2 MODULAR CARPET

- A. Products: Specifically as indicated on Interior Finishes plans and schedules.
1. Construction: Tufted patterned cut/loop pile
 2. Dye Method: 100% Solution dyed
 3. Fiber: Type 6,6 Nylon, with manufacturer's soil-resistance treatment.
 4. Backing: manufacturer's standard synthetic non-woven for adhesive installation.
 5. Average Pile Yarn Density: 5,000 ounces per cubic yard minimum.
 6. Pile Height: 0.11 inches (2.8 mm) minimum
 7. Average Weight: 14 oz/sq.yd. minimum.

8. Antimicrobial Treatment: Manufacturer's standard.

2.3 MODULAR ENTRY / WALK-OFF CARPET

- A. Products: Specifically as indicated on Finishes plans and schedules.
 1. Construction: Tufted patterned cut/loop pile
 2. Dye Method: 100% Solution dyed
 3. Fiber: Type 6,6 Nylon, with manufacturer's soil-resistance treatment.
 4. Backing: manufacturer's standard synthetic moisture-barrier, non-woven, for adhesive installation.
 5. Average Pile Yarn Density: 7,000 ounces per cubic yard minimum.
 6. Pile Height: 0.18 inches (4.7 mm) minimum
 7. Average Weight: 30 oz/sq.yd. minimum.
 8. Antimicrobial Treatment: Manufacturer's standard.

2.4 BROADLOOM CARPET

- A. Products: Specifically as indicated on Interior Finishes plans and schedules.
 1. Construction: Tufted patterned cut/loop pile, or tip sheared
 2. Dye Method: 100% Solution dyed
 3. Fiber: Type 6,6 Nylon, with manufacturer's soil-resistance treatment.
 4. Backing: manufacturer's standard synthetic non-woven for adhesive installation.
 5. Average Pile Yarn Density: 7,000 ounces per cubic yard minimum.
 6. Average Weight: 28 oz/sq.yd. minimum.
 7. Antimicrobial Treatment: Manufacturer's standard.
 8. Width: 12 feet wide rolls minimum.
- B. Broadloom Carpet Padding: Product approved by broadloom carpet manufacturer, flat rubber or urethane foam, 1/4 inch thick, minimum density 16 pounds per cubic foot, for full-adhesive installation.

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Total VOCs: 10.00 mg/sq. m x h.
 - b. Formaldehyde: 0.05 mg/sq. m x h.
 - c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.
- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Transition Strips: PVC, viny, rubber, or metal of least height and profile required to protect edge of carpet and smoothly transition to adjacent flooring.
 - 1. Maximize lengths to minimize running joints.
 - 2. Glue-down type with manufacturer's recommended adhesive.
 - 3. Wheel-friendly, with slopes and edges meeting ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet or cushion manufacturer.
 - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet and cushion manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and carpet and carpet cushion manufacturers' written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
 - 2. Double-Glue-Down Installation: Comply with CRI 104, Section 10, "Double Glue-Down Installation."
 - 3. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 11, "Attached-Cushion Installations."
 - 4. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
 - 5. Hook-and-Loop Installation: Comply with CRI 104, Section 11.5, "Hook and Loop Technology."
 - 6. Stretch-in Installation: Comply with CRI 104, Section 12, "Stretch-in Installation."
- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with Architect's approval of pattern layout.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period.

END OF SECTION 096800

SECTION 097200 - WALLCOVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Vinyl wall covering.
 - 2. Textile wall covering.
 - 3. Wood-veneer wall coverings.
- B. Related Sections include the following:
 - 1. Division 09 Section for painting, primers, and coatings.
 - 2. Division 09 Section for Gypsum Board.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- C. Samples: For each type of wall covering indicated, minimum sample size of 12"x12".
- D. Schedule: For wall coverings. Use same designations indicated on Drawings.
- E. Maintenance Data: For wall coverings to include in maintenance manuals.

1.4 CERTIFICATIONS

- A. Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program. Provide current product certification documentation from certification body.
- B. Provide primers, aerosol, and non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of

CDPH Section 01350 (limit requirements regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for primers and adhesives.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Growth Contribution: Interior wall and ceiling finish materials shall be classified per ASTM E-84 or UL 723, and tested per NFPA 286.
 - 2. Surface-Burning Characteristics:
 - a. Flame-Spread Index:
 - 1) Class A, for all exit stairs and exit passageways: 25 or less.
 - 2) Class B, minimum for exit corridors: 75 or less.
 - 3) Class C, for other rooms: 200 or less.
 - b. All Products: Smoke-Developed Index: 450 or less.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wall coverings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Lighting: Do not install wall covering until the designed permanent level of lighting, at a minimum, is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 WALL-COVERING PRODUCTS

- A. See interior finish schedules provided by Architect for basis of design products.
- B. General: Provide rolls of each type of wall covering from the same run number or dye lot.
 - 1. ASTM F-793 for wall coverings that qualify as:
 - a. Category III, Decorative with High Serviceability

- b. Category IV, Type I Commercial Serviceability
 - c. Category V, Type II Commercial Serviceability
 - d. Category VI, Type III Commercial Serviceability
2. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.
- C. Vinyl Wall-Coverings: Provide mildew-resistant products complying with the following:
1. FS CCC-W-408 and CFFA-W-101:
 - a. Type II, Medium-Duty – 13 oz. per sq. yd. min, for general use in areas where there is average traffic and scuffing possible.
 - b. Type III, Heavy-Duty – 22 oz. per sq. yd. min, for wainscoting or lower wall protection for areas exposed to high traffic conditions.
 2. Micro-perforated, vapor-permeable, to allow breathability through the wallcovering.
- D. Textile Wall Covering: Provide mildew-resistant products complying with the following:
1. Colorfastness to Wet and Dry Crocking: Passes AATCC 8, Class 3, minimum.
 2. Colorfastness to Light: Passes AATCC 16A or AATCC 16E, Class 4, minimum, at 40 hours.
 3. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.
- E. Wood-Veneer Wall Coverings: Consisting of genuine wood veneer bonded to a non-woven adhesive-barrier backing, with a protective urethane sealer factory applied.
1. Color and Wood Species: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer, and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew-resistant primer/sealer recommended in writing by wall-covering manufacturer for intended substrate.
- C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall-covering manufacturer.
- D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity.
 - 3. Metals: If not factory primed, clean and apply metal primer.
 - 4. Gypsum Board: Prime with primer recommended by wall-covering manufacturer.
- D. Check painted surfaces for pigment bleeding, and treat areas susceptible to pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.
- G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

- C. Install strips in same order as cut from roll.
- D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches from corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.
- F. Fully bond wall covering to substrate. Do not allow air bubbles, wrinkles, blisters, and other defects.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 098000 - ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes various types of sound attenuation insulation.
- B. Related Sections include the following:
 - 1. Division 05 Sections for metal framing.
 - 2. Division 06 Sections for wood framing and miscellaneous wood blocking.
 - 3. Division 09 Sections for Gypsum Board and other wall finishes.
 - 4. Division 07 Sections for Thermal Insulation, Sheathing, and other envelope components.
 - 5. Division 21 Sections for Fire-Suppression Systems Insulation.
 - 6. Division 22 Sections for Plumbing Insulation.
 - 7. Division 23 Sections for HVAC Insulation.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. E84 Test Method for Surface Burning Characteristics
 - 2. E90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - 3. E96 Test Method for Water Vapor Transmission of Materials
 - 4. E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees F. (unfaced)
 - 5. C423 Test Method for Sound Absorption and the Sound Absorption Coefficient by the Reverberation Room Method
 - 6. C665 Standard Specification for Mineral Fiber Blanket Insulation for Light Frame Construction and Manufactured Housing.

1.4 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

- A. Product Data: Provide product literature and installation instructions.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 1. Surface-Burning Characteristics meeting ASTM E-84.
 2. Fire-Resistance Ratings meeting ASTM E-119.
 3. Combustion Characteristics meeting ASTM E-136.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- B. Where glass-fiber blanket insulation is indicated, provide blankets in batt or roll form:
 - 1. 3-1/2 inches thick minimum, or as required for STC assembly noted on Drawings; maximum flame spread 25, maximum smoke developed 50.
- C. Product: Subject to compliance with requirements, provide one of the following:
 - 1. "QuietZone Acoustic Batts" by Owens Corning
 - 2. "Sound Control Batts" by Johns Manville
 - 3. "Quiet Therm" by Knauf Insulation GmbH (Shelbyville, Indiana)

2.2 ACOUSTICAL SPRAYS

- A. Acoustic Spray for concealed joints: Provide sprayable acrylic latex material complying with ASTM C-919 and the following:
 - 1. Spray effectively reduces airborne sound transmission through head-of-wall joints in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
 - 2. Acoustical Spray to maintain STC ratings at sound rated partitions as indicated on the drawings.
 - 3. Spray has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
 - 4. Spray is mold and mildew resistant per ASTM G21 with a rating of zero (0), "no growth".
 - 5. Spray has movement capability of minimum 12.5%.
- B. Product: Subject to compliance with requirements, provide one of the following:
 - 1. CP-572 Smoke and Acoustical Spray by Hilti
 - 2. SNS Smoke'n'Sound Acoustical Spray by Specified Technologies Inc. (STI)
 - 3. TREMstop Smoke & Sound Spray by Tremco, Inc.

2.3 ACOUSTICAL FLOOR MAT

- A. Lightweight floor underlayment mat designed to be placed over a wood or concrete sub-floor and under a gypsum concrete, or lightweight concrete rigid overlayment, to improve the STC-rating of the flooring system.
 - 1. Closed cell polyethylene foam or:
 - 2. Random filament polypropylene entangled mesh
 - 3. Thickness: 3/8-inch
 - 4. Flame Spread per ASTM E-84: 0

- B. Product: Subject to compliance with requirements, provide one of the following:
 - 1. Acousti-Mat 3/8" by Maxxon Corp. (Basis of Design)
 - 2. Quiet Zone Acoustic Floor Mat by Owens Corning
 - 3. Firm-Fill SCM-400 by Hacker Industries, Inc.

2.4 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Non-hardening, premium siliconized acrylic sealant for interior and exterior use. Paintable, water clean-up. For use around base and sill plates, cut-outs in gypsum board, veneer plaster systems, and other areas where a sound rated assembly is required. Also for use around all electrical boxes and outlets, cold air returns, heating and air conditioning ducts, and other utility equipment penetrating wall surfaces for increased acoustical performance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

3.4 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Install minimum 3-inch-thick, unfaced glass fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation at least 48 inches on either side of partition.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 098000

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete and Concrete masonry units (CMU).
 - 2. Clay Masonry and Brick
 - 3. Steel and Galvanized Metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood.
 - 6. Plastic and vinyl fabrications.
 - 7. Exterior fiber-cement panels.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming and painting of metal substrates.
 - 2. Division 06 Sections for shop primed carpentry.
 - 3. Division 08 Sections for factory primed windows and doors.

1.3 REFERENCES

- A. MPI: The Master Painters Institute (MPI-#): Established paint categories and standards.
- B. GS-11: Green Seal Standard for Paints, Coatings, Stains, and Sealers, Edition 4.0
- C. ANSI: American National Standards Institute: Performance Standards.
- D. ASTM: American Society for Testing Materials: Testing Methods.
- E. OTC: Ozone Transmission Commission: Established levels of Volatile Organic Compounds.
- F. SCAQMD-1168: South Coast Air Quality Management District Rule #1168
- G. EPA 40 CFR Part 59: National Volatile Organic Compound Emission Standards for Architectural Coatings: Limits, in grams VOC per liter, for various coating categories.

1.4 DEFINITIONS

- A. Standard coating terms defined in ASTM D16 apply to this section.
- B. Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 max.
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 min.
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	> 85	

1.5 SUBMITTALS

- A. Product List: Reference to clarify paint systems indicated, and locations of application areas, and matching designations indicated on Drawings and in schedules.
- B. Product Data: For each type of product indicated, including block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and coating material proposed for use.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing and applying each coating material proposed for use.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
- C. Samples for Initial Selection: For each color and type of topcoat product indicated.
- D. Samples for Verification: For each type of paint system and in each color and gloss indicated.
 - 1. Submit Samples on rigid backing, 8 inches square or larger.
 - 2. Step or cascade coats on Samples to show each coat required for the complete system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application substrate.
- E. Submittals required when painting over existing surfaces:
 - 1. Prior to paint application, submit to the Designer in writing test results verifying the compatibility of the paint scheduled to be applied to the existing surface.

2. If test results indicate that the existing surfaces are not compatible with the newly scheduled paint system, submit to the Designer in writing a substitute paint system recommended by the paint manufacturer for that existing surface.

- F. Sustainable Design Submittals that may be required include, but are not limited to:
1. EPD: Environmental Product Declaration
 2. HPD: Health Product Declaration
 3. CSR: Corporate Sustainability Report, including Sourcing of Raw Materials
 4. Third-Party Certification of Life Cycle Assessment

1.6 QUALITY ASSURANCE

- A. Master Painters Institute Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Installer Qualifications: All products listed in this section are to be applied by a Painting Contractor with a minimum of five years demonstrated experience in surface preparation and field application of the same type and scope as specified.
- C. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide sample area of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply one set of additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
 3. Touch up or refinish mock-up areas as required to be integrated into final Work.
 4. Approval of mock-ups does not constitute approval to deviate from the Contract Documents; obtain any changes resulting from mock-ups with approvals in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with controlled temperatures and humidity continuously maintained as recommended by product manufacturers.
1. Maintain containers in clean condition, free of foreign materials and residue.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local AHJs.

1. Remove rags and waste from storage areas daily.

C. Disposal:

1. Never pour leftover coating down any sink or drain.
2. Do not incinerate or burn containers.
3. For specific disposal or recycling options, contact the local waste management agency.

1.8 PROJECT CONDITIONS

- A. Environmental conditions (weather, temperature, humidity, and ventilation) must be within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide systems by one of the following:
1. Sherwin-Williams
 2. Benjamin-Moore
 3. PPG Paints

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and with substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by the manufacturer for use in paint system and on substrate indicated.

B. Colors: **As indicated on drawings or as selected by Architect from manufacturer's full range.**

C. VOC Content: Provide products that comply with EPA 40 CFR Part 59 National VOC Emission Standards for Architectural Coatings, especially Subpart D for VOC content limits.

D. Mixing and Tinting:

1. Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate and stir all paint prior to and during application to ensure uniform color, gloss, and consistency.
2. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

3. Thinner addition shall not exceed manufacturer's printed recommendations and shall be of the correct type for the product. Do not use kerosene or other organic solvents to thin water-based paints.

2.3 PAINT AND COATING SYSTEMS

- A. Asphalt Surfaces:
 1. For traffic marking of drive and parking areas
 2. Waterborne Acrylic-Alkyd
 3. MPI #32 – Traffic Marking Paint, Solvent Based
 4. MPI #70 – Traffic Marking Paint, High-Build Acrylic
- B. Concrete, CMU, and Brick Vertical Surfaces:
 1. Including walls and overhead horizontal soffits
 2. MPI #3 – Water-based Alkali-Resistant Primer
 3. MPI #4 – Water-based Latex Block Filler
 4. MPI #15 or MPI # 214 – Exterior Latex Intermediate and Top Coat
- C. Concrete Horizontal Surfaces:
 1. Including floors and stairs
 2. MPI # 116 – Epoxy Block Filler
 3. MPI #82 – Epoxy Slip-Resistant Deck Coating
- D. Cementitious Composition Board Surfaces:
 1. MPI #3 – Water-based Alkali-Resistant Primer
 2. MPI #214 or MPI #10 – Water-based Exterior Acrylic Latex
 3. MPI #40 – Water-based, High-build, High-solids Exterior Acrylic Latex
- E. Structural Steel and Metal Fabrications:
 1. Exposed columns, beams, joists, railings, stairs, etc.
 2. MPI #79 – Alkyd Anti-Corrosive Primer for Metal
 3. MPI # 19 – Zinc-rich Inorganic Primer
 4. MPI #9 or MPI #94 – Alkyd Exterior Rust-Inhibitive Enamel
 5. MPI # 72 – Two-Component Polyurethane
- F. Steel - High Heat:
 1. Including boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc.
 2. MPI #21 – Heat Resistant Enamel
- G. Galvanized Metal:
 1. Including doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.
 2. MPI #25 – Cleaner, Etching for Galvanized Metal
 3. MPI #164 – Water-based Light Industrial Coating
- H. Aluminum:
 1. Including sills and frames, flashing, posts and railings, conduit, etc.
 2. MPI # 95 – Alkyd-based Aluminum Primer
 3. MPI #1 – Alkyd-based Aluminum Paint

- I. Dimension Lumber and Engineered Wood:
 - 1. Including exposed wood columns, beams, exposed joists, underside of decking, etc.
 - 2. MPI #6 – Water-based Latex Primer for Exterior Wood
 - 3. MPI #11 or MPI #119 – Water-based Latex Exterior Enamel
- J. Stained Dressed Lumber:
 - 1. Including doors, door and window frames, casings, etc.
 - 2. MPI #13 – Exterior Solvent-based Semi-Transparent Stain
 - 3. MPI #14 – Exterior Solvent-based Solid-Hide Stain
 - 4. MPI #71 or MPI # 31 – Polyurethane Moisture-Cured Varnish
- K. Wood Decks and Stairs / Steps:
 - 1. MPI #5 – Alkyd/Oil based Primer for Exterior Wood
 - 2. MPI #14 – Alkyd/Oil based Solid-Hide Pigmented Stain
- L. Fiberglass and Plastic:
 - 1. Including panels, trims, vinyl siding and windows including related trims, etc.
 - 2. MPI #3 – Water-based Alkali-resistant Primer
 - 3. MPI #10 or MPI #214 – Water-based Exterior Acrylic Latex
- M. Stucco and EIFS:
 - 1. MPI #3 – Water-based Alkali-resistant Primer
 - 2. MPI #10 – Water-based Exterior Acrylic Latex

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Report in writing to the Designer any conditions that may potentially affect proper application. Do not commence until such conditions have been corrected.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
 - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove surface oxidation.
- J. Wood Substrates:
 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- M. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- N. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Coordinate with the requirements of Divisions 21 thru 28.
- B. Remove grilles, covers, and access panels and paint separately.
- C. Finish paint primed equipment to the color selected.
- D. Prime and paint exposed pipes, conduits, boxes, ducts, hangers brackets, collars, and supports, except where items are plated or covered with a pre-finished coating, with color and texture to match adjacent surfaces.
- E. Replace identification markings on mechanical or electrical equipment when painted over or splattered.
- F. Paint interior surfaces that are visible through grilles and louvers with one coat of flat black paint to the limit of sight line.
- G. Paint both sides and edges of plywood backerboards for electrical equipment before installing backerboards and mounting equipment on them.

3.6 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete and Concrete masonry units (CMU).
 - 2. Steel and Galvanized metal.
 - 3. Aluminum (not anodized or otherwise coated).
 - 4. Wood.
 - 5. Gypsum board.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop primed metal substrates.
 - 2. Division 06 Sections for shop primed carpentry and casework.
 - 3. Division 08 Sections for factory primed windows and doors.
 - 4. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 REFERENCES

- A. MPI: The Master Painters Institute (MPI-#): Established paint categories and standards.
- B. GS-11: Green Seal Standard for Paints, Coatings, Stains, and Sealers, Edition 4.0
- C. ANSI: American National Standards Institute: Performance Standards.
- D. ASTM: American Society for Testing Materials: Testing Methods.
- E. OTC: Ozone Transmission Commission: Established levels of Volatile Organic Compounds.
- F. SCAQMD-1168: South Coast Air Quality Management District Rule #1168
- G. EPA 40 CFR Part 59: National Volatile Organic Compound Emission Standards for Architectural Coatings: Limits, in grams VOC per liter, for various coating categories.

1.4 DEFINITIONS

- A. MPI: The Master Painters Institute.
- B. Standard coating terms defined in ASTM D16 apply to this section.
- C. Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 max.
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 min.
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	> 85	

1.5 SUBMITTALS

- A. Product List: Reference to clarify paint systems indicated, and locations of application areas, and matching designations indicated on Drawings and in schedules.
- B. Product Data: For each type of product indicated, including block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and coating material proposed for use.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing and applying each coating material proposed for use.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
- C. Samples for Initial Selection: For each color and type of topcoat product indicated.
- D. Samples for Verification: For each type of paint system and in each color and gloss indicated.
 - 1. Submit Samples on rigid backing, 8 inches square or larger.
 - 2. Step or cascade coats on Samples to show each coat required for the complete system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Submittals required when painting over existing surfaces:
 - 1. Prior to paint application, submit to the Designer in writing test results verifying the compatibility of the paint scheduled to be applied to the existing surface.

2. If test results indicate that the existing surfaces are not compatible with the newly scheduled paint system, submit to the Designer in writing a substitute paint system recommended by the paint manufacturer for that existing surface.

- F. Sustainable Design Submittals that may be required include, but are not limited to:
1. EPD: Environmental Product Declaration
 2. HPD: Health Product Declaration
 3. CSR: Corporate Sustainability Report, including Sourcing of Raw Materials
 4. Third-Party Certification of Life Cycle Assessment

1.6 QUALITY ASSURANCE

- A. Master Painters Institute Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Installer Qualifications: All products listed in this section are to be applied by a Painting Contractor with a minimum of five years demonstrated experience in surface preparation and field application of the same type and scope as specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with controlled temperatures and humidity continuously maintained as recommended by product manufacturers.
1. Maintain containers in clean condition, free of foreign materials and residue.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local AHJs.
1. Remove rags and waste from storage areas daily.
- C. Disposal:
1. Never pour leftover coating down any sink or drain.
 2. Do not incinerate or burn containers.
 3. For specific disposal or recycling options, contact the local waste management agency.

1.8 PROJECT CONDITIONS

- A. Environmental conditions (weather, temperature, humidity, and ventilation) must be within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide one of the following:

1. Sherwin-Williams
2. Benjamin-Moore
3. PPG Paints

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: **As indicated on drawings or as selected by Architect from manufacturer's full range.**

C. VOC Content: Provide products that comply with EPA 40 CFR Part 59 National VOC Emission Standards for Architectural Coatings, especially Subpart D for VOC content limits.

D. Interior finish materials other than those applied to floors shall be Class A, B, or C as tested and classified in accordance with ASTM 84E for flamespread and smoke development.

E. Mixing and Tinting:

1. Except where specifically noted, all paint shall be ready-mixed and pre-tinted. Agitate and stir all paint prior to and during application to ensure uniform color, gloss, and consistency.
2. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
3. Thinner addition shall not exceed manufacturer's printed recommendations and shall be of the correct type for the product. Do not use kerosene or other organic solvents to thin water-based paints.

F. Except as noted herein or indicated on the Finish Schedule, interior walls and ceiling surfaces shall be painted in accordance with the following criteria over appropriate prime / sealer coat:

1. All areas (except as noted): washable latex with G3 (eggshell) finish.
2. Laundry facilities / rooms, public wash / shower / bathrooms, residential kitchens and bathrooms and ensuites: washable latex or alkyd with G5 (semi-gloss) finish.
3. Public change / wash / shower rooms and institutional facility bathing and shower rooms: epoxy (tile-like) G5 (semi-gloss) finish for wet surfaces.

4. Public and institutional facility “clean” or “sanitary” areas such as food preparation and laboratory areas: epoxy (tile-like) G5 (semi-gloss) finish for dry surfaces.

2.3 PAINT AND COATING SYSTEMS

- A. Concrete, CMU, and Brick Vertical Surfaces:
 1. Including walls and overhead horizontal soffits
 - a. MPI #3 – Water-based Alkali-Resistant Primer
 - b. MPI #4 – Water-based Latex Block Filler
 - c. MPI #44 or MPI #52 – Interior Latex Intermediate and Top Coat
 2. For high-moisture areas:
 - a. MPI #116 – Two-Component High-Solids Epoxy Block Filler
 - b. MPI #98 – Two-Component High-Build Epoxy Coating
- B. Concrete Horizontal Surfaces:
 1. Including floors and stairs
 2. MPI #116 – Two-Component High-Solids Epoxy Block Filler
 3. MPI #108 – Epoxy High-build, High-solids, Low-gloss coating
 4. For Concrete Stains: MPI #58 – Penetrating semi-transparent stain
 5. For Concrete Sealer: MPI #99 – Water-based Acrylic stain-resistant sealer
- C. Structural Steel and Ferrous Metal Fabrications:
 1. Exposed columns, beams, joists, railings, stairs, doors, frames etc.
 - a. MPI #107 – Water-based Rust-Inhibitive Primer
 - b. MPI #54 or MPI #114 – Water-based Interior Latex
 2. For high-moisture areas:
 - a. MPI #101 – Anti-corrosive Epoxy Primer for Metal
 - b. MPI #77 or MPI #98 – Two-component Epoxy Coating
- D. Steel - High Heat:
 1. Including boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc.
 2. MPI #21 – Heat Resistant Enamel
- E. Galvanized Metal:
 1. Including doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.
 2. MPI #25 – Cleaner, Etching for Galvanized Metal
 3. MPI #134 – Water-based Primer for Galvanized Metal
 4. MPI #153 or MPI #154 – Water-based Light Industrial Coating
- F. Aluminum:
 1. Including sills and frames, posts and railings, conduit, etc.
 2. MPI #107 – Water-based Rust-Inhibitive Primer
 3. MPI #168 or MPI #169 – Water-based Alkyd-Acrylic Enamel
- G. Dimension Lumber and Engineered Wood:
 1. Including exposed wood columns, beams, exposed joists, plywood, etc.
 2. MPI #39 – Water-based Latex Primer for Interior Wood
 3. MPI #43 or MPI #54 – Water-based Latex Interior Enamel

4. MPI #155 – Water-based Latex Dry-Fall
- H. Stained Dressed Lumber, Wood Paneling, and Casework:
 1. Including doors, door and window frames, casings, etc.
 2. MPI #90 – Solvent-based Semi-transparent Pigmented Stain
 3. MPI #56 or MPI #57 – Solvent-based Oil-modified Polyurethane Varnish
- I. Painted Dressed Lumber, Wood Paneling, and Casework:
 1. Including doors, frames, casings, shelving, millwork, wall panels, etc.
 2. MPI #45 or MPI #46 – Solvent-based, Alkyd type Primer-Sealer for Interior Wood
 3. MPI #47 or MPI #48 – Solvent-based, Alkyd type Interior Enamel
 4. MPI # 39 – Water-based Latex Primer for Interior Wood
 5. MPI #141 – High-Performance Interior Latex Coating
- J. Wood Floors and Stairs / Steps:
 1. MPI #56 or MPI #57 – Solvent-based Oil-modified Polyurethane Varnish
 2. MPI #31 – Solvent-based Moisture-Curing Polyurethane Clear Coat
 3. MPI #78 – Aliphatic Two-Component Polyurethane Clear Coat
- K. Glue Laminated Beams and Columns:
 1. MPI #78 – Aliphatic Two-Component Polyurethane Clear Coat
- L. Fiberglass and Plastic:
 1. Including panels, trims, vinyl siding and windows including related trims, etc.
 2. MPI #3 – Water-based Alkali-resistant Primer
 3. MPI #10 or MPI #214 – Water-based Exterior Acrylic Latex
- M. Spray Textured Ceilings and Surfaces:
 1. MPI #118 – Water-based Latex Dry-Fall
 2. MPI #133 – Water-based Latex Dry-Fall for Galvanized Steel
- N. Plaster and Gypsum Board (Drywall):
 1. MPI #50 – Water-based Latex Primer-Sealer
 2. MPI #44 or MPI #52 – Water-based Acrylic-Latex Interior
 3. For high-moisture areas:
 - a. MPI #115 or MPI #215 – Water-based Epoxy-modified Latex

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Report in writing to the Designer any conditions that may potentially affect proper application. Do not commence until such conditions have been corrected.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
 - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- M. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- N. Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Coordinate with the requirements of Divisions 21 thru 28.
- B. Removed grilles, coves, and access panels and paint separately.
- C. Finish paint primed equipment to the color selected.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers brackets, collars, and supports, except where items are plated or covered with a pre-finished coating.
- E. Replace identification markings on mechanical or electrical equipment when painted over or splattered.
- F. Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to the limit of sight line.
- G. Paint exposed conduit and electrical equipment occurring in finished areas. Color and texture to match adjacent surfaces.
- H. Paint both sides and edges of plywood backerboards for electrical equipment before installing backerboards and mounting equipment on them.

3.6 STENCILED RATING WALLS

- A. Stencil on both sides of all smoke- or fire-rated partitions with permanent 2" high letters.
 1. Color: Bright red.
 2. Identify the rating of the partition approximately 8" above the finished ceiling every 25 feet on both sides of the partition, or at least once in each space.
 3. Identify walls as applicable:
 - a. 1 HOUR FIRE
 - b. 2 HOUR FIRE
 - c. NON-RATED SMOKE TIGHT
 - d. Or other identifying language as appropriate.

4. Identification shall be approved by the authority having jurisdiction.

3.7 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099123

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
 - 1. Interior Exposed wood panel products.
- B. Related Sections include the following:
 - 1. Division 06 Sections for Wood products, including wall paneling, casework, and trims.
 - 2. Division 08 Sections for Wood Doors and casing trims.
 - 3. Division 09 Section "Interior Painting" for surface preparation and application of standard paint systems on interior substrates.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of finish system and in each color and gloss of finish indicated.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
 - 2. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of MPI's current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.

1.4 QUALITY ASSURANCE

- A. Master Painters Institute Standards:
 - 1. Products: Complying with MPI standards indicated and listed in its "MPI Approved Products List."

STAINING AND TRANSPARENT FINISHING

2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and finish systems indicated.

B. Additional Quality Standards:

1. Architectural Woodwork Institute (AWI)
2. American National Standards Institute (ANSI)

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 90 deg F.
- B. Do not apply exterior finishes in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

B. Stain Colors: **As selected by the Architect from manufacturer's full range.**

- C. Stains shall be factory mixed. Field mix coatings in paste or powder form are not allowed. Stain material shall be applied full strength; thinning is not allowed. Refer to drawings for stain types and location.

2.2 INTERIOR FRAMES, JAMBS, & TRIMS FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 900.

B. Grade: Custom.

2.3 INTERIOR FRAMES, JAMBS, & TRIMS FOR OPAQUE FINISH

A. Quality Standard: Comply with AWI Section 900.

B. Grade: Custom.

2.4 MACHINING AND FITTING

A. All wood frames shall be machined by the manufacturer for hinges, locks and all hardware requiring routing and mortising. Any required dados for frame assembly will be performed by the manufacturer prior to finishing.

1. Machining will be performed with final hardware schedules, shop drawings, hardware templates and other essential information required to insure proper fit of doors, frames relite components and hardware.
2. Machining tolerances will be in accordance with ANSI/WDMA I.S. 1-A1 1997.
3. Fire-rated frames will be machined under observation and in strict accordance with the requirements of the listing agency.

2.5 SHOP FINISHING

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. Retain subparagraph below and delete other grade requirements, or delete below and specify grades under finish types. Finish grade can be different from Construction grade.

1. Grade: Provide finishes of same grades as items to be finished.

C. General: Shop finish transparent finished interior frames at fabrication shop as specified in this Section. Refer to Division 9 Section "Painting" for finishing opaque finished frames.

D. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing frames, as applicable to each unit of work.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:

1. Grade: Custom.
 - a. AWI Finish System TR-0: Synthetic penetrating oil.
 - b. AWI Finish System TR-1: Standard lacquer.
 - c. AWI Finish System TR-2: Catalyzed lacquer.
 - d. AWI Finish System TR-3: Water-reducible acrylic lacquer.
 - e. AWI Finish System TR-4: Conversion varnish.
 - f. AWI Finish System TR-5: Catalyzed vinyl lacquer.
 - g. AWI Finish System TR-6: Catalyzed polyurethane.
2. Staining: Match approved sample for color

STAINING AND TRANSPARENT FINISHING

3. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
 4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 5. Sheen: Semigloss, 55-75 gloss units.
- F. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
1. Grade: Custom.
 - a. AWI Finish System OP-1: Standard lacquer.
 - b. AWI Finish System OP-2: Catalyzed lacquer.
 - c. AWI Finish System OP-3: Water-reducible acrylic lacquer.
 - d. AWI Finish System OP-4: Conversion varnish.
 - e. AWI Finish System OP-5: Catalyzed vinyl lacquer.
 - f. AWI Finish System OP-6: Catalyzed polyurethane.
 2. Color: As selected by Architect from the full range of colors available in finish system specified.
 3. Sheen: Semigloss, 55-75 gloss units.

2.6 STAINS AND TRANSPARENT FINISHES

- A. Stain surfaces in accordance with the following *MPI* Painting Manual requirements:
- B. WOOD FILLERS
1. Wood Filler Paste: MPI #91.
- C. PRIMERS AND SEALERS
1. Alkyd Sanding Sealer: MPI #102.
 2. Lacquer Sanding Sealer: MPI #84.
 3. Shellac: MPI #88.
- D. STAINS
1. Interior Wood Stain (Semitransparent): MPI #90.
- E. POLYURETHANE FINISHES
1. Two-Component Aliphatic Polyurethane (Clear): MPI #78.
 2. Interior, Oil-Modified, Clear Urethane (Satin): MPI #57, Gloss Level 4.
 3. Interior, Oil-Modified, Clear Urethane (Gloss): MPI #56, Gloss Level 6.
 4. Moisture-Cured Clear Polyurethane (Flat): MPI #71, Gloss Level 1.
 5. Moisture-Cured Clear Polyurethane (Gloss): MPI #31.
- F. WATERBORNE ACRYLIC FINISHES
1. Waterborne Clear Acrylic (Satin): MPI #128, Gloss Level 4.
 2. Waterborne Clear Acrylic (Semigloss): MPI #129, Gloss Level 5.
 3. Waterborne Clear Acrylic (Gloss): MPI #130, Gloss Level 6.
- G. LACQUERS
1. Lacquer (Clear Flat): MPI #87, Gloss Level 1.
 2. Lacquer (Clear Satin): MPI #85, Gloss Level 4.

3. Lacquer (Clear Gloss): MPI #86, Gloss Level 6.

2.7 INTERIOR WOOD-FINISH-SYSTEMS

A. Finish Carpentry Substrates:

1. Moisture-Cured Clear Polyurethane Over Stain System: MPI INT 6.3Y.
 - a. Stain Coat: Interior wood stain (semitransparent).
 - b. Three Finish Coats: Moisture-cured clear polyurethane (gloss).
2. Moisture-Cured Clear Polyurethane Over Stain System: MPI INT 6.3X.
 - a. Three Finish Coats: Moisture-cured clear polyurethane (gloss).
3. Clear, Two-Component Polyurethane System: MPI INT 6.3Z.
 - a. Three Finish Coats: Two-component aliphatic polyurethane (clear).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
 3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
 4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 1. After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.

STAINING AND TRANSPARENT FINISHING

1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
 3. Countersink steel nails, if used, and fill with putty tinted to final color to eliminate rust leach stains.
- D. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions.
1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when finishes are being applied:
1. Owner may engage the services of a qualified testing agency to sample finish materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces if, on refinishing with complying materials, the two finishes are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

STAINING AND TRANSPARENT FINISHING

- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

END OF SECTION 099300

SECTION 099656 - EPOXY COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Conduct a pre-installation meeting to ensure coordination of this work with the work of other trades, per Section 013119.

1.2 SUMMARY

- A. This Section includes surface preparation and application of epoxy coating systems.
 - 1. Two-component epoxy coatings for various substrates.
- B. Related Sections may include:
 - 1. Division 03 Sections for Concrete
 - 2. Division 04 Sections for Unit Masonry
 - 3. Division 09 Sections for Gypsum Board
 - 4. Division 22 Sections for Plumbing floor drains and built-in piping
 - 5. Other Divisions for various substrates and surface preparation.

1.3 SUBMITTAL

- A. Product Data: For each type of product indicated. Include manufacturer's product data sheets on each individual component product to be used to comprise the entire flooring system.
 - 1. Label and reference products to each coating system and locations of application areas.
- B. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 - 1. Submit Samples on rigid backing, 8 inches min. square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.4 QUALITY ASSURANCE

- A. Provide coordinating products from same manufacturer to form the total coating system. Manufacturer shall certify that materials for use within each coating system are compatible with one another and substrates indicated, under conditions of service and application intended.

- B. The Installer shall have at least 5 years experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product system specified.
- C. A pre-installation conference shall be held to review this specification, installation schedule, application procedure, quality control, inspection, and acceptance criteria.
- D. Contractor shall provide a supervisor at the work site who will be consistently present during all phases of the flooring installation, including sub-surface preparation, protection of adjacent work, and coating application operations.
- E. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All materials are to be delivered to the job site in the manufacturer's original packaging. The product code and other identification marks should be clearly marked and visible on each container.
 - 1. Verify that "kits" are complete for the coating system requirements, including any primers, slurries, mix-components, broadcast materials, and top coats; and verify that quantities of each required product are correct BEFORE starting installation.
- B. Store materials not in use in tightly covered containers in dry, well-ventilated areas with ambient temperatures continuously maintained within acceptable ranges required by the materials manufacturer.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.
- C. Material Safety Data Sheets are to be kept on site and made readily available for all personnel.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when air and substrate temperatures, and air humidity and substrate moisture levels are within acceptable ranges as required by the flooring system manufacturer.
- B. Measure floor substrate or concrete slab moisture content prior to starting work.
- C. Verify the existence and condition of vapor barriers, drains, and any other items or substances that may impact the procedure of the work.
- D. Maintain proper lighting and visibility throughout the work environment; the lighting should be at least as bright as the final lighting level of the space.
- E. Store and dispose of any waste in accordance with regulations of local authorities.

1.7 INSTALLATION WARRANTY

- A. The Contractor shall agree to repair, at his own expense, any defects in the floor coating system for a period of two years (from the finished date of installation) caused by improper substrate preparation or improper workmanship in the floor coating system installation.
 - 1. The installer shall not be held responsible for floor coating failure due to circumstances beyond his control, including moisture from below the concrete slab, and concrete slab or building wall cracking or settling.

PART 2 - PRODUCTS

2.1 EPOXY COATINGS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. Provide products of same manufacturer for each coat in a coating system.
- B. Restricted Components: Coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.

- C. Colors: As selected by Architect from manufacturer's full range.

2.2 EPOXY COATING SYSTEMS PER MASTER PAINTERS INSTITUTE STANDARDS:

- A. Water-Based Interior Epoxy: MPI #115 or MPI #215. A water based two component epoxy-modified latex paint for prepared interior surfaces.
- B. High-Solids Epoxy: MPI #108. A two component epoxy, high solids, low gloss coating for use on interior or exterior concrete, masonry and primed metal surfaces.
- C. Epoxy Deck Coating: MPI #82. A solvent based, two component epoxy, non-slip coating for interior and exterior metal decks.
- D. Heavy Commercial Solvent-Based Epoxy: MPI #77 or MPI #177. A solvent based, two component, epoxy coating specified for wall and floor surfaces in moderate to heavy traffic commercial and moderate industrial environments.
- E. Epoxy for Ferrous Metals: MPI #120. A two component epoxy, high solids, low gloss coating for use on interior or exterior ferrous metal surfaces.
- F. Block Filler Epoxy: MPI #116. A solvent based, two component, epoxy, high solids coating for interior and exterior block surfaces that are to be coated with a chemically resistant finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Measure the existing moisture content of substrates to confirm tolerances within floor coating manufacturer's recommendations. Measure all substrate materials to be in contact with floor coating, including, but not limited to, concrete, masonry, wood, gypsum board, and metals.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Measure air humidity and temperature, and verify maintenance of acceptable ventilation throughout the Work.
 - 4. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 5. Proceeding with coating application indicates contractor's verification of and satisfaction with surfaces and conditions.

3.2 PREPARATION

- A. Comply with floor coating system manufacturer's written instructions and recommendations applicable to substrates affected.
 - 1. Do not coat surfaces if moisture content, alkalinity of surfaces, or other parameters cannot be corrected to within those permitted in manufacturer's written instructions.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers or existing coatings if required, and prepare substrate with compatible primers as required to produce coating systems indicated.
 - 2. Surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
 - 3. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk.
 - 4. Masonry Substrates: Remove efflorescence and chalk.
 - 5. Steel Substrates: Remove rust and loose mill scale.
 - 6. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
 - 7. Aluminum Substrates: Remove surface oxidation.
 - 8. Wood Substrates:
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of knot sealer before applying primer. Fill holes and imperfections in the finish surfaces with putty or plastic wood filler.
 - b. Sand surfaces that will be exposed to view and remove all dust.
 - c. Prime edges, ends, faces, undersides, and back sides of wood.
 - 9. Substrates shall be dry and moisture removed as per floor coating recommendations prior to proceeding with installation.

3.3 APPLICATION

- A. Apply epoxy coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- D. Cure epoxy material in compliance with manufacturer's directions, taking care to prevent contamination during the time required for the flooring system to completely cure.

3.4 FIELD QUALITY CONTROL

- A. The finished epoxy coating shall not show cloudiness, spotting, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Visible unevenness in texture, gloss, thickness, or color shall be considered the results of improper workmanship, and shall be corrected at the Contractor's expense.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 099600

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plaques and signage as required by the ADA-ABA Accessibility Guidelines.
 - 2. Address Identification as required by the local Authorities Having Jurisdiction.
 - 3. Signage identifying room spaces and room or unit numbers.

1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.
- D. Samples for Verification: For each product:
 - 1. Sample plaque 6 inches square.
 - 2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
- E. Sign Schedule: For all signage to be provided in the project.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify signage locations by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs, and types of anchorage required and appropriate for the mounting substrate.
- B. Address Identification: Characters are required to be a minimum of 6 inches high. Verify location of mounting with Architect and Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All signage materials shall be impervious to most acids, alkalis, alcohol, solvents, abrasives and boiling water; with the core a contrasting color from characters, and rated non-static, fire-retardant and self-extinguishing.

2.2 INTERIOR SIGNAGE

- A. Interior signage shall be molded construction approximately 1/8" thick (1/4" thick for Slot signs), of solid melamine plastic laminate or high-impact acrylic, with face color contrasting from core color.
 - 1. Tactile characters/symbols shall be raised 1/32" from sign plate face.
 - 2. Room numbers shall be 1" tall minimum.
 - 3. Lettering shall be 3/4" tall minimum.
 - 4. Grade 2 braille shall be below copy.
 - 5. Edges to be straight, with square corners.
 - 6. Matte, non-glare finish.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include the following:
 - 1. ASI Sign Systems Inc.
 - 2. Mohawk Sign Systems Inc.
- C. Permanent function rooms or spaces (e.g. toilets, elevators, custodial closets, and mechanical and electrical rooms) shall have identifying signs.
- D. Stair enclosures shall have signs identifying the space as a stair, identifying the current floor, and identifying on which level exiting occurs.

- E. All exterior doors, doors to stairwells, and doors out of assembly rooms require tactile signs (Grade 2 Braille) if the door has an exit sign above it. Tactile exit signs shall be located on the latch side of a single door. Either side is acceptable for double doors.
- F. Room number and room name or other copy to be verified with Owner.

2.3 EXTERIOR SIGNAGE

- A. Exterior signage shall be Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
 - 1. Baked-enamel finishes designed for exterior exposure.
- B. Verify location for address numbers on the building with the Owner. Adhesive numbers on glass may be used on storefront entrances with transom or side panels. Otherwise, raised brushed aluminum numbers at least 6" high, contrasting and clearly visible against the background.
- C. Provide signage at parking as required at accessible locations.
- D. When not all entrances are accessible, provide wayfinding signage as required to indicate directions to accessible entrances.

2.4 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts where 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.
 - 1. Use concealed fasteners wherever possible. Do not use prominent mechanical fasteners on the face of the signage due to potential injury or confusion to the visually impaired.
- B. Adhesives: Pressure sensitive adhesive or high grade industrial silicone adhesive as recommended by the adhesive manufacturer for the substrates shown.

2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 2. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.6 FINISHES, GENERAL

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in 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.
- B. Colored coatings shall remain stable and water resistant for three years beyond Substantial Completion for application intended.
- C. Provide graphically precise, uniformly opaque characters to conform to relevant ADA Accessibility Guidelines and requirements indicated for size, style, spacing, content, position and color and 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable, 60 inches maximum height measured from the floor to the top of the sign, or per ADA regulations.
 - 1. Confirm acceptable mounting heights and location with local AHJ inspector.
- B. Install signs in accordance with manufacturer's instructions, using mounting methods recommended by manufacturer for the sign materials supplied and appropriate to the substrates.
- C. Install signs level and plumb, with sign surfaces free of distortion and other defects in appearance.

3.3 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 101400

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Impact-resistant handrails.
 - 2. Corner guards.
- B. Related Sections include the following:
 - 1. Division 09 Sections for Gypsum Board and other wall sheathings.
 - 2. Division 09 Sections for Interior Painting, wall coverings, and other finishes.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Handrails: Provide handrails capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, anchors, and connections:
 - 1. Concentrated load of 200 lbf applied at any point and in any direction.
 - 2. Uniform load of 50 lbf/ft. applied in any direction.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.
- B. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples: For each type of impact-resistant wall-protection unit indicated.
 - 1. Include similar Samples of accent strips, exposed fasteners, and accessories to be installed with each type of wall protection product.

- D. Material Test Reports: For each impact-resistant plastic material.
- E. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive data to Architect for review.
- C. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E-84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature and controlled humidity within storage area at not less than 65 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.
- B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Manufacturer's special warranty in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "Acrovyn" by Construction Specialties Inc (the CS Group).
 - 2. Tepromark Architectural Products
 - 3. InPro Architectural Products.

2.2 MATERIALS

- A. General: Plastic materials are to have the following characteristics:
 - 1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
 - 2. Chemical and Stain Resistance: Tested according to ASTM D 543.
 - 3. Self-extinguishing when tested according to ASTM D 635.
 - 4. Flame-Spread Index: 25 or less.
 - 5. Smoke-Developed Index: 450 or less.
- B. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout.
- C. Plastic Sheet Wall Covering Material: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, semirigid, high-impact-resistant PVC or acrylic-modified vinyl plastic sheet with integral color throughout.
- D. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant.
- E. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.
- F. Stainless-Steel Sheet: ASTM A 240/A 240M.
- G. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

- H. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.

2.3 WALL GUARDS

- A. Hand Rail: Assembly consisting of continuous rigid plastic surface offset from the wall on an extruded aluminum mounting bracket designed for impact shock absorption. Manufacturer to include mounting hardware.
 - 1. Height: Approx. 3", with 1-1/2" round grip surface
 - 2. Ends have factory-formed radius back to terminate close to wall surface.
- B. Basis of Design Product: Acrovyn Construction Specialties Inc (the CS Group) HRB-35 Series.

2.4 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of a replaceable snap-on plastic cover installed over concealed aluminum retainer, including mounting hardware.
- B. Flush-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover that is flush with adjacent wall surface, installed over continuous aluminum drywall retainer.
 - 1. Flexible for impact shock absorption, with easily replaceable extruded cover piece.
 - 2. Exposed corner bullnose radiused to between 1/4" and 1 inch, per Architect's selection.
- C. Basis of Design Products:
 - 1. Acrovyn Construction Specialties Inc (the CS Group):
 - a. SM-20 Series: snap-on covers with 3" legs, 8-ft. lengths
 - b. VA Series: adhesive-mounted, 1-1/2" legs, 8-ft. lengths

2.5 FABRICATION

- A. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
2. For impact-resistant wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Public-use washroom accessories.
 - 2. Private-use bathroom accessories.
 - 3. Childcare accessories.
 - 4. Underlavatory guards.
 - 5. Automatic hand dryers.
- B. Related Sections include the following:
 - 1. Division 06 Sections for quartz, solid-surface, and cultured marble fabrications.
 - 2. Division 08 Section for custom frameless mirrors.
 - 3. Division 09 Section for Tiling around toilet and bath accessories.
 - 4. Division 10 Section for Toilet Partitions, stalls, and screens.
 - 5. Division 22 for Plumbing fixtures.

1.3 REFERENCES

- A. ANSI A117, Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. ADA, Accessibility Guidelines for Buildings and Facilities, Federal Register Volume 56, Number 144, Rules and Regulations.
- C. Fair Housing Amendments Act, Accessibility Guidelines, Federal Register Volume 56, Number 44.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

3. Material and finish descriptions.
 4. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated on Drawings.
 2. Identify products using designations indicated on Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices that are to be set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304.
- B. Galvanized Steel Sheet: ASTM A-653, with G60 hot-dip zinc coating.
- C. Galvanized Steel Mounting Devices: ASTM A-153, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- E. Chrome Plating: ASTM B-456, Service Condition Number SC 2 (moderate service).
- F. Mirrors: ASTM C-1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC / COMMERCIAL WASHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Specialties, Inc.
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Bradley Corporation.
- B. Refer to schedule on drawing sheets for basis-of-design manufacturer and model numbers.

2.3 PRIVATE / RESIDENTIAL WASHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Delaney Hardware
 - 2. Pioneer Industries
 - 3. Kohler Co.
- B. Refer to schedule on drawing sheets for basis-of-design manufacturer and model numbers.

2.4 CHILDCARE ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Infant Care Products Inc.
 - 2. Koala Corporation.
- B. Refer to schedule on drawing sheets for basis-of-design manufacturer and model numbers.

2.5 UNDERLAVATORY GUARDS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Plumberex Specialty Products, Inc.
 - 2. Truebro, Inc.
- B. Underlavatory Guard:
 - 1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
 - 2. Material and Finish: Antimicrobial, molded-plastic, white.

2.6 AUTOMATIC HAND DRYERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Xlerator model XL-SB by Excel Dryer
 2. Extreme Air Original GXT by American Dryer
 3. TrimLine B-7128 High Speed Hand Dryer by Bobrick
 4. Airblade V by Dyson
- B. Automatic Electric Hand Dryer:
1. Warm air, rapid drying, energy efficient electric hand dryer, surface mounted; entire dryer internally grounded.
 2. Cover: One-Piece Aluminum or Stainless Steel, Brushed finish.
 3. Air Intake: Small circular inlet openings on bottom of unit.
 4. Air Outlet: Delivers focused air stream of between 12,000 and 16,000 LFM at average hand position of 4 inches below air outlet.
 5. Electronic sensor shall automatically turn dryer on when hands are held under air-outlet opening and across path of sensor. Dryer shall turn off automatically when hands are removed. Sensor shall automatically shut dryer off approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening.
 6. Unit shall comply with EU Directive "Restriction of Hazardous Substance" (ROHS) requirements for non-use of certain hazardous substances in the production of electronic products.
 7. Power Source: 220/240 volt, 6.5 amp, 60 Hz

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled, free from burrs or sharp edges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal (keyed-alike) keys for internal access to accessories for servicing and resupplying. Provide minimum of four (4) keys for each keyed unit to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Fire protection cabinets to hold portable fire extinguishers.

B. Related Sections:

- 1. Division 10 Section "Signage" for directional signage to out-of-sight fire extinguishers and cabinets.
- 2. Division 10 Section "Fire Extinguishers."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include cut sheets, construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- C. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION CABINET

- A. Products: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "Architectural Series" by Larsen's Manufacturing Co.
 - 2. "Apex" or "Safeguard" series by Strike First Corporation of America
- B. Cabinet Type: Suitable for fire extinguisher.
- C. Cabinet Construction: 1-hour fire rated.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.
- D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semirecessed cabinet installation.
- G. Cabinet Trim Material: Stainless-steel sheet
- H. Door Material: 304 Stainless Steel
- I. Door Style: Vertical view panel with frame

- J. Door Glazing: Clear acrylic sheet
- K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting lever handle with cam-action latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- L. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - a. Identify fire extinguisher in fire protection cabinet with the words **FIRE EXTINGUISHER**
 - 1) Location: Applied to cabinet door
 - 2) Application Process: Engraved, etched, decals, or pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red
- M. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for interior of cabinet and door.
 - 2. Stainless Steel: No. 4 for the exterior of the cabinet.

2.2 GENERAL FINISH REQUIREMENTS

- 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 of fire protection cabinets from damage.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

3.2 INSTALLATION

- A. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets wherever possible.
 - 2. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
 - 3. Provide surface-mounted cabinets only in locations approved by architect, to verify protrusion from wall.

3.3 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 – PORTABLE FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers.
- B. Related Section: Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

- A. Product Data: Cut sheets and data for each type of product indicated. Include location, rating and classification, material descriptions, dimensions of individual components and profiles for fire extinguisher.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Listed and labeled by Underwriter's Laboratory (UL) or Factory Mutual (FM) for type, rating, and classification.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Multi-Purpose Dry Chemical: 2-A Rating Minimum, 5 lb. capacity typ., unless otherwise noted on drawings.

1. Products: Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to, the following:
 - a. "MP Series" by Larsen's Manufacturing Co.
 - b. "ABC Series" series by Strike First Corporation of America

- B. Purple-K Dry Chemical where indicated for kitchens: specially fluidized and siliconized potassium bicarbonate dry chemical effective on Class B flammable liquids and pressurized gases. 5 lb. minimum capacity.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

SECTION 105500 – POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Recessed front-loading mailboxes.
- B. Related Sections Include:
 - 1. Division 05 Sections for Metal Framed walls and miscellaneous metal supports and trims.
 - 2. Division 06 Sections for Wood framing, wood blocking, and other woodwork into which mailboxes assemblies may be integrated.
 - 3. Division 09 Sections for Gypsum board and other interior finishes to be coordinated with mailbox installations.

1.3 REFERENCES

- A. United States Postal Service (USPS) Standard 4C Wall-Mounted Centralized Mail Receptacles
- B. Americans with Disabilities Act Accessibility Guidelines (ADAAG) for Buildings and Facilities.
- C. ANSI A117, Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and opening preparation.
 - 3. Material and finish descriptions with cleaning instructions and staging and handling recommendations.
- B. Shop Drawings: Prepared specifically for this project to show dimensions of mailboxes, wall framing and opening requirements, and interface details with other work.
- C. Finish Selection Samples: Two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- D. Product Schedule: Indicating types, quantities, sizes, and installation locations.
 - 1. Identify numbering system and unique identifier of each mailbox.
- E. Maintenance Data: For mailbox systems to include in maintenance manuals.
 - 1. Include care and cleaning instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2008 certified.

1.6 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of postal specialties that fail in materials or workmanship within five (5) years from date of purchase.

PART 2 - PRODUCTS

2.1 CENTRALIZED MAILBOXES

- A. Horizontal style, front-loading group compartments, recessed wall-mounted.
 - 1. Consisting of multiple compartments with fixed, solid compartment backs, enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by individual swinging compartment doors.
- B. Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
 - 1. Series 4000 by Jensen Mailboxes Manufacturing Company
 - 2. 3700 Series by Salisbury Industries
 - 3. 4C Recessed Mount by Florence Corporation
- C. Compartment Doors: Fabricated from extruded aluminum. Equip each compartment door with lock, engraved tenant identification, and concealed, continuous hinge on one side.
- D. Aluminum Finish: Selected from manufacturer's standard powder coat colors.
- E. Locks: 5-pin cylinder lock on each compartment, 2 keys each lock; capable of 1,000 key changes; each compartment keyed differently.
 - 1. Master key lock for mail distribution by USPS.
- F. Unit identification: Alpha-numeric engraving, unique to each compartment.

- G. Outgoing mail collection compartment with tamper-resistant input slot.

2.2 PARCEL LOCKERS

- A. Front-Loading, Lobby Parcel Lockers: Provide units designed to be used independently from mailbox installation. Provide access to compartments for distributing incoming parcels from front of unit. Provide access to each compartment for removing parcels by swinging compartment door.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that framed openings in wall are correctly located, aligned, and sized for mailboxes, with correct blocking and substrates as required for attachment anchors and supports.

3.2 INSTALLATION

- A. Install mailboxes in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Align, plumb, and level; anchor in accordance with manufacturer's requirements. Verify that all hinges swing freely and that doors open and close without scratching or sticking.
- C. Lubricate locks in accordance with manufacturer's instructions, and protect locks and finishes from damage by subsequent activities.

END OF SECTION 105500

SECTION 107316 - CANOPIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work in this section includes furnishing and installation of extruded aluminum wall-supported canopies.
- B. Related Sections include the following:
 - 1. Division 04 Sections for Unit Masonry and masonry veneer and flashing.
 - 2. Division 05 Sections for Metal Fabrications and structural steel framing supports.
 - 3. Division 07 Sections for Sheet Metal Flashing and Trim and Metal Roof Panels.
 - 4. Division 07 Section "Joint Sealants".

1.2 REFERENCES

- A. Structural welding code steel AWS D1.1 and AWS D1.2
- B. The Aluminum Association (AA):
 - 1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.
- C. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- D. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
 - 2. American Society for Testing and Materials (ASTM):
 - 3. ASTM B-209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
 - 4. ASTM B-221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 5. ASTM C-150, Specification for Portland Cement.
 - 6. ASTM C-404, Specification for Aggregates for Masonry Grout.

1.3 SUBMITTALS

- A. Shop Drawings: Show shop and erection details, including cut, copes, connections holes and welds. Show welds, both shop and field, by the current recommended symbols of the AWS. Do not fabricate members until shop drawings have been reviewed.

1. Overall canopy layout dimensions
 2. Cut section details including elevation, bent layout dimensions, and connection details
 3. Flashing details pertaining to aluminum canopy
 4. Concrete footing and/or canopy anchorage details
- B. Product Data: Submit manufacturer's product information, specifications, and installation instructions for the aluminum canopy.
- C. Samples: Submit color selection samples of actual coated aluminum material or actual anodized aluminum material.
- D. Certification: Provide design calculations bearing the seal of a Registered Professional Engineer certifying that the proposed canopy design and layout meets or exceeds all applicable loadings (ex: wind load, rain live load, dead load, snow load) for the job location (city & state) in accordance with the IBC and ASCE 7.

1.4 QUALITY ASSURANCE

- A. Requirements of Awning manufacturer and Awning Contractor, contractor must provide proof of certifications:
1. Have been in continuous operation as a professional metal canopy manufacturer for a minimum of ten (10) years prior to this contract.
 2. Welder Qualifications: The personnel manufacturing the metal awning frames must be certified welders.
- B. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where the project is located, and who is experienced in providing engineering services for installing metal canopies similar to those indicated for this project and with a record of successful in-service performance.
- C. Components shall be assembled in shop to greatest extent possible to minimize field assembly.

1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide pre-engineered canopies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated for the specific location where Canopy will be installed:
1. Uniform pressure as indicated on drawings - minimum design wind load per ASCE 7.
- B. Thermal Movements: Provide pre-engineered canopies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.6 FIELD CONDITIONS

- A. Field Measurements: The Contractor shall verify location and elevation of footings relative to finished grade, columns, and other construction contiguous with pre-engineered metal canopies by field measurements before fabrication and indicate measurements on shop drawings.
- B. Contractor is responsible to coordinate footer locations and elevations with any interferences with or attachments to abutting structures.

1.7 WARRANTY

- A. Warrant frame materials and workmanship against defects for a period of one (1) year from date of substantial completion of the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Mapes Canopies
 - 2. Tennessee Valley Metals, Inc. (TVM)
 - 3. Peachtree Awnings & Canopies
 - 4. Architectural Fabrication Inc.
 - 5. Classic AlumaDeck Inc.

2.2 MATERIALS

- A. Beams:
 - 1. Beams are to be open topped aluminum tubular extrusion of size indicated on shop drawings.
 - 2. Size of beam used shall accommodate applied loadings without over-stress or over-deflection. Minimum beam size shall be 4"x 6" at 0.125" thick.
 - 3. Structural steel shall be painted with a rust inhibitive (red oxide) primer.
- B. Decking:
 - 1. Decking shall be a rigid roll-locked design that is self-flashing and utilizes interlocking sections.
 - 2. Extruded aluminum decking is to be 2-1/2" min.
 - 3. Roll Formed is allowed upon the architect's shop drawing approval.
 - 4. Where decking is run parallel to walkway, the ends of the pans shall be welded closed where decking does not terminate into a drain beam.
- C. Gutter

1. Gutter shall be radius cornered aluminum extrusion of size indicated on architect's drawings. Minimum gutter size shall be 4"x 6" at 0.093" thick.
 2. 24 gage hot-dip galvanized steel with baked enamel finish.
- D. False Fascia
1. False Fascia shall be aluminum extrusion of size indicated on architect's drawings. Minimum fascia size shall be 1"x 6" at 0.070" thick.
 2. 24 gage hot-dip galvanized steel with a baked enamel finish.
- E. Flashing shall be made of aluminum sheet painted to match the color of the canopy. Minimum flashing thickness shall be 0.040" thick.
- F. Hardware and Fasteners: Nuts, bolts, washers, clevis pins, screws, anchors and pipe spacers to be zinc plated or galvanized steel required to suit application and per pre-engineered canopy load requirements.
- G. Hanger Rods: Zinc plated steel and powder coat (Prime and paint are not acceptable.)
1. Provide compression spacers at airspace between veneer and structure of type and thickness recommended by canopy engineer for the specific application.

2.3 FABRICATION

- A. Fabricate awning and frames in strict accordance with the reviewed shop drawings, written welding procedure specifications and the reference standards.
- B. Welding: In accordance with ANSI/AWS D1.2. Welding shall be performed in the shop to the maximum extent possible; field welding should be minimized, only with manufacturer approval and oversight.
- C. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each.
- D. Canopy Finishes: Comply with NAAMM Metal Finishes Manual for recommendations for applying and designating finishes
1. Color coating: Shop-applied, two-coat spray coating system, 70% Kynar 500 FSF resin-based fluoropolymer coating system, or approved equal, to comply with AAMA 2605.
 - a. Color to be selected by Architect from manufacturer's full available colors, including metallic or mica colors where available.
 2. Color Anodic Finish: AA-M12C22A42/A44, Anodic Coating, Architectural Class I, integrally colored or electrolytically deposited color coating 0.7 mils or thicker, complying with AAMA 611.
 - a. Color: Anodized Dark Bronze as basis of design, or as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected
1. Examine supporting foundations for compliance with manufacturer's requirements, including installation tolerances and other conditions affecting performance of supporting members.
 2. Check installed anchor bolts for accuracy. Verify that bearing surfaces are ready to receive the work.
 3. Verify the rough-in of required mechanical and electrical services prior to placement of the structure.
 4. If preparation is the responsibility of another installer, notify the Architect of unsatisfactory preparation before proceeding.
 5. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

- A. Canopies are to be installed according to approved shop drawings and plans.
- B. The entire structure shall be installed straight, true, and plumb according to standard construction procedures.
- C. Canopies shall be installed with positive and negative slope of 1/8" per foot to allow water drainage from top of canopy to draining columns and eliminate ponding.
- D. Non-draining columns shall have weep holes installed at top of concrete to remove condensation from post. Minimum weep hole size shall be 1/4" in diameter.
- E. All joints, corners, and connections shall be tight and clean.
- F. All exposed fasteners are to be painted to match the canopy color.

3.3 CLEANING AND PROTECTION

- A. After installation, restore marred or abraded surfaces to original condition using same paint or coating as factory-applied finishes, when the results are acceptable to the Architect, otherwise replace damaged equipment.

END OF SECTION 107316

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Cooking equipment including:
 - a. Electric cooktops, ranges, or stoves
 - b. Microwave ovens.
2. Range hoods, including residential stovetop fire extinguishers.
3. Refrigerator/freezers.
4. Cleaning appliances:
 - a. Dishwashers.
 - b. Clothes washers and dryers, where applicable.
5. Trash compactors.

- B. Related Sections include the following:

1. Division 06 Sections for Interior Architectural Woodwork including cabinets and countertops that receive appliances.
2. Division 22 Sections for Water Piping, Sanitary and waste vent piping, and Plumbing Fixtures.
3. Division 26 Sections for Electrical connections, power, and fixtures.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.

1. Product Data for residential range/stove fire suppression system, to be installed over the cooktop in each unit.

- B. Appliance Schedule: For appliances; use room designations indicated on Drawings.

- C. Maintenance Data: For each product to include in maintenance manuals.

- D. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible, provide appliances by a single manufacturer for entire Project.
- B. Regulatory Requirements: Comply with provisions of the following product certifications:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
 - 3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
 - 4. NAECA: Provide residential appliances that comply with NAECA standards.
- C. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ANSI A117.1.
- D. AHAM Standards: Provide appliances that comply with the following Association of Home Appliance Manufacturers standards:
 - 1. Dishwashers: AHAM DW-DW1.
 - 2. Electric Ranges: AHAM ER-1.
 - 3. Clothes Dryers: AHAM HLD-1.
 - 4. Household Refrigerators: AHAM HRF-1.
 - 5. Household Freezers: AHAM HRF-1.
 - 6. Trash Compactors: AHAM TC-1.
- E. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.
 - 1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

1.5 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
 - 1. Electric Range: Five-year limited warranty for surface-burner elements.
 - 2. Microwave Oven: Five-year limited warranty for defects in the magnetron tube.
 - 3. Refrigerator/Freezer: Five-year limited warranty for the sealed refrigeration system.
 - 4. Freezer: Five-year limited warranty for the sealed refrigeration system.
 - 5. Dishwasher: 10-year warranty against deterioration of tub and door liner.
 - 6. Clothes Washer: 10-year limited warranty for the inner wash basket and outer tub, and five-year limited warranty for the balance suspension system and drive transmission.

PART 2 - PRODUCTS

2.1 APPLIANCES, GENERAL

- A. Major Appliances: Non-portable or semi-portable machines used for routine housekeeping tasks such as cooking, washing laundry, or food preservation.
 - 1. Verify whether considered “fixtures” considered part of the real estate. Coordinate requirements with Owner.
 - 2. Verify special electrical connections, connections to gas supplies, or special plumbing and ventilation arrangements that may be permanently connected to each appliance.

- B. Approved Manufacturers:
 - 1. GE
 - 2. KitchenAid
 - 3. Whirlpool
 - 4. Kenmore
 - 5. Broan

- C. Provide appliances with manufacturer's standard finishes, primarily stainless steel surfaces with uniform, directionally textured finish.
 - 1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 - 2. Other colors integrated into appliance finishes (typically black or white) to be selected from the Architect by the manufacturer’s standard range.

2.2 RANGE/STOVE FIRE PROTECTION

- A. Residential Range/Stove Automatic Fire Protection: Automatic fire extinguishing system mounted over a cooktop, underneath an over-range microwave, or underneath a range hood.
 - 1. Units shall protect all burners of the stove – verify quantity of units or sets to be installed at each cooktop location.
 - 2. Activated by flames below, each unit’s flame-detector will automatically release fire suppressant.
 - 3. Non-electric, no batteries required.
 - 4. Verify clearance required from fire-extinguisher unit mounting to the cooktop surface below, to select the correct model and canister size.
 - 5. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to:
 - a. “Stovetop Firestop” by Williams RDM, Inc.
 - b. “Auto-Out” Cooktop Fire Suppressors

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

3.3 CLEANING AND PROTECTION

- A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 113100

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Horizontal louver blinds with polymer faux wood slats.
- B. Related Sections include the following:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Samples: For each type and color of horizontal louver blind indicated.
- D. Window Treatment Schedule: Use same designations for windows as indicated on Drawings.
- E. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds 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 horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds 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 POLYMER FAUX WOOD HORIZONTAL SLAT BLINDS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. "Avalon" by CACO Inc.
 - 2. "Everwood" by Hunter Douglas Architectural
 - 3. "Faux Wood" by SWF Contract
 - 4. "NuWood Privacy Slat" by Levolor, Inc.
- B. Slats: UV-stabilized solid polymer or PVC slats to mimic the look of raised-texture wood grain.
 - 1. Width: approx. 2 inches.
 - 2. Thickness: Not less than 0.01 inch.
 - 3. Not less than nominal 7.2 slats per foot to ensure tight closure and light control.
- C. Headrail: Formed steel with long edges returned or rolled; fully enclosing operating mechanisms on three sides with end plugs. Baked finish to match slat appearance and color.
- D. Bottom Rail: Trapezoid-shaped extruded PVC or polystyrene matching slats, with plastic or metal capped ends bottom contoured for minimizing light gaps; with enclosed ladders and tapes to prevent contact with sill.
- E. Ladders: Braided string, evenly spaced to prevent long-term slat sag.
- F. Lift Cords: Manufacturer's standard braided polyester.

- G. Tilt Control: Manual, with baked-enamel-coated, corrosion-resistant steel wand.
 - 1. Length of Tilt Control: Length required to make operation convenient from floor level.
 - 2. Tilt: Full.
- H. Lift Operation: Manual cord lock; locks pull cord to stop blind at any position in ascending or descending travel.
- I. Valance: Manufacturer's standard to match slat material, 2-1/2 inches high maximum.
- J. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer's full range.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

- A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings:
 - 1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
- C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.
- D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from noncorrosive materials between hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- E. Mounting: Within window opening, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.
- F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, 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, other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.
- B. Jamb Mounted: Install headrail flush with face of opening jamb and head.
- C. Head Mounted: Install headrail on face of opening head.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind 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 horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired.

END OF SECTION 122113

SECTION 142423 - HYDRAULIC ELEVATORS (MACHINE-ROOM-LESS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes hydraulic passenger and service elevators.
1. Elevator shall include:
 - a. Standard pre-engineered hydraulic elevator(s).
 - b. Elevator car enclosures, hoistway entrances and signal equipment.
 - c. Operation and control systems.
 - d. Jack(s).
 - e. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 - f. Materials and accessories as required to complete the elevator installation.
- B. Related Sections include the following:
1. Division 03 Sections for Cast-in-Place Concrete for setting sleeves, inserts, and anchoring devices in concrete.
 2. Division 04 Sections for Unit Masonry and CMU for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 3. Division 05 Sections for Structural Steel Framing including:
 - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills that are part of steel frame.
 4. Division 05 Sections for Metal Fabrications including:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Machine beams.
 - c. Weld plates.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants in hoistways made from steel sheet.
 5. Division 09 Sections for finish flooring in elevator cars.
 6. Division 09 Sections for Gypsum Board and shaft wall framing at hoistway walls.
 7. Division 21 for fire suppression systems in elevator shaft.
 8. Division 22 for pit sump pump and piping.

9. Division 23 Sections for ventilation in elevator lobbies and shafts.
 10. Division 26 Sections for electrical service to elevators and lighting.
 11. Division 27 for telephone and communication service to elevators.
 12. Division 28 for security access system equipment used to restrict elevator use.
 13. Division 28 Sections for Fire Detection and Alarm for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
- C. General contractor shall provide the following in accordance with the requirements of the adopted Building Code and ANSI A17.1 Elevator Code. State or local requirements must be used if more stringent.
1. Hoist beam at the top of the elevator shaft.
 2. Wall inserts, anchors, bearing plates, brackets, supports and bracing.
 3. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 48" minimum above sill of access door or handgrips.
 4. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals.
 5. Provide and install finished flooring in elevator cab.
 6. Finished floors and entrance walls may not be constructed until after sills and elevator door frames are in place. Consult elevator contractor for rough opening size required for installation.
 7. Provide any drywall framing so that the wall fire resistance rating is maintained, where drywall construction is used.
 8. Fill and grout around all entrance frames at masonry construction.
 9. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
 10. Provide telephone line, light fixture, and convenience outlet in the hoistway at the landing where the elevator controller is located. Final location must be coordinated with elevator supplier.
 11. For signal systems and power operated door: provide ground and branch wiring circuits.
 12. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
 13. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1 apply to work of this Section.
- B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
- C. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 REFERENCES

- A. ANSI/ASME A17.1 - Safety Code for Elevators and Escalators.
- B. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- C. NFPA 70 - National Electrical Code (NEC).
- D. NFPA 72 – National Fire Alarm and Signaling Code
- E. NFPA 80 - Fire Doors and Windows.
- F. NFPA 101 – Life Safety Code
- G. ANSI/UL 10B - Fire Tests of Door Assemblies.

1.5 SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
 - 1. Car enclosures and hoistway entrances.
 - 2. Operation, control, and signal systems.
 - 3. Interior finish standard options.
- B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit, dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- D. Qualification Data: For Installer.
- E. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- G. Warranty: Special warranty specified in this Section.

- H. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain elevators and major elevator components through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with latest edition of ASME A17.1.
 - 1. Seismic Performance Category 'A'.
- D. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." and ICC A117.1.
- E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.
- B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.8 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Furnish well casing and coordinate delivery with related excavation work.
- C. Coordinate sequence of elevator installation with other work to avoid delaying any trades.
- D. Coordinate in advance locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.
- E. Electrical Power: Arrange for temporary GFCI-protected electricity to be available for installation of elevator components.

- F. Preinstallation Meeting: Conduct prior to elevator delivery, with elevator installer and representatives of all affected trades, to review conditions of installation, preparation and installation procedures and coordination with related Work and work under separate contracts.

1.9 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

- 1. Warranty Period: **One year** minimum from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide one full year of maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

- 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
 - a. Response Time: Two hours or less.
 - 3. Thirty days before expiration of the twelve (12) month maintenance service, the elevator contractor shall schedule an inspection of the elevator equipment with the Owner or his representative. This inspection is to assure that the elevator equipment is in safe first-quality, operating condition and the equipment is operating in line with its original design. An authorized representative of the elevator contractor shall accompany the Owner or his representative.
 - 4. Examinations and log: During the warranty maintenance period the elevator contractor shall maintain maintenance records as per ANSI A17.1 Code for each elevator. The records shall be kept on site in a secure location, and be used to indicate all call backs, repairs, replacement of parts, fire service test and adjustments performed by the mechanic. Each entry in the maintenance records shall be signed by the mechanic who performs the work and be kept up-to-date at all times.

- B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering similar products that may be incorporated into the Work include the following:
1. "Endura" MRL by TK Elevator Corporation
 2. "Hydrofit" by Otis Elevator Co.
 3. Schumacher's MRL Elevator.

2.2 SYSTEMS AND COMPONENTS

- A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard preengineered elevator systems and as required for complete system.
- B. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- C. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- D. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- E. Guides: Slide guides shall be mounted on top and bottom of the car.
- F. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- G. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Typical jack type: Twin post holeless telescopic 3-stage. Two jacks piped together, mounted one on each side of the car with each having three telescopic sections designed to extend in a synchronized manner when oil is pumped into the assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. A follower guide shall be furnished for the top of the lower two plungers and be guided by rollers running inside a steel guide channel which is firmly attached to the guide rail system. This plunger guide system shall maintain a stabilized support for the plunger sections. Each jack assembly shall have check valves built into the assembly to allow for automatically re-syncing the three plunger sections by moving the jack to its fully contracted position

- H. Wiring, Piping, and Oil: GC to provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided by elevator supplier to connect the power unit to the jack unit.
- I. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
 2. An oil hydraulic pump.
 3. An electric motor.
 4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- J. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- K. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- L. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
 5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
 6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
 7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
 8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.
- M. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided by elevator supplier. Once activated, elevator shall run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

- N. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. A means for manual operation of the valve in the pit is also required.
- O. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- P. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel at controller landing entrance jamb and should be sized according to the National Electrical Code.
- Q. Lockable circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel at controller landing entrance jamb should be sized according to the National Electrical Code.

2.3 CONTROL / OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system and software for each elevator or group of elevators as required to provide type of operation system indicated.
 - 1. All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.
 - 2. Complete 3 phase connections from the electric power mains to each controller, including necessary circuit breakers and fused mainline disconnect switches.
- B. Elevator Controller Location: Door Jamb or Wall access (no separate machine room).
 - 1. The controller shall be distributed throughout the elevator system located in the overhead, cab and inspection and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
- C. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- D. Service Panel shall be accessible from outside the hoistway, adjacent to the controller in the hoistway entrance jamb, and shall provide the following functionality:
 - 1. Access to main control board and CPU
 - 2. Main controller diagnostics
 - 3. Main controller fuses
 - 4. Universal Interface Tool
 - 5. Remote valve adjustment
 - 6. Electronic motor starter adjustment and diagnostics
 - 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit

8. Operation of auxiliary pump/motor (secondary hydraulic power source)
9. Operation of electrical assisted manual lowering
10. Provide male plug to supply 110VAC into the controller
11. Run/Stop button

E. Auxiliary Operations:

1. Battery-Powered Lowering: When power fails, car is lowered to the pre-designated floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
3. Inspection Operation: controls on the top of the car to perform inspections.

F. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at car control stations and hall push-button stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers.

G. Keyswitches for Manual Operation: Push buttons are activated and deactivated by security keyswitches at in-car control panel and hall push-button stations at designated levels. Key is removable only in deactivated position.

1. Provide a number of keys equal to the number of elevators plus two extra keys.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 33 or more microprocessor-controlled, infrared light beams projecting across car entrance from ground level to a height of at least six feet. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Door Operators: The door operator shall open the car door and hoistway door simultaneously, at a speed of 2.5 ft. per second. The closing speed of the doors shall be 1 ft. per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 1.5 inches maximum of door movement. Door operation shall be quiet, smooth, fast, and shall provide dynamic braking for door reversals.

C. In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.

2.5 FINISH MATERIALS

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Cold-Rolled Steel Sheet: ASTM A-1008, commercial steel, Type B, exposed, matte finish. Provide with factory-applied enamel finish, color selected by Architect.
- C. Stainless-Steel Sheet: ASTM A-240, Type 304 with No. 4 directional satin finish.
- D. Aluminum Extrusions: ASTM B-221, Alloy 6063.
- E. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications, color, texture, and pattern as selected by Architect from manufacturer's full range of products.

2.6 HOISTWAY ENTRANCES

- A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
 - 1. A minimum 8-1/2" wall thickness is required for the controller location of machine-room-less installations.
- B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- C. Hoistway Doors and Frames:
 - 1. UL rated with required fire rating.
 - 2. Doors: Rigid flush panel construction with reinforcement ribs.
 - 3. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.
- D. Finish:
 - 1. Exposed Areas of Corridor Frames: #4 stainless steel on all floors.
 - 2. Doors: #4 stainless steel on all floors.
 - 3. Sills: Aluminum on all floors.
- E. Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors.
 - 1. Provide flush (inlaid) mount cast braille plates wherever possible; or surface-mount cast braille plates if inlaid is not possible.
- F. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.
- G. Provide landing identification inside the hoistway to the side of entrance doors. Stencil 4" min. high numerals both 12" above the bottom and 12" below the top of the door panel at each level.

2.7 CAR ENCLOSURES

- A. General: Provide steel-framed car enclosures with nonremovable wall panels, with car roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
 - 2. Provide finished car including materials and finishes specified below.

- B. Cab Materials: Provide manufacturer's standards, but not less than the following:
 - 1. Fire rating: Provide Class B fire rating for cab, or Class A fire rating where required by local Code.
 - 2. Fabricate car with recesses and cutouts for signal equipment.
 - 3. Fabricate car door frame integrally with front wall of car.
 - 4. Ventilation: Provide one-speed fan in canopy.
 - 5. Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - 6. Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged.
 - 7. Emergency Exit Switch: Provide an electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control and the car will be unable to move.
 - 8. Emergency Exit Lock: Provide an emergency exit lock where required by local code.
 - 9. Emergency Exit Guard: Provide emergency exit guard on top of car when required for hoistway wall to platform clearance exceeds 12" or for multiple cars in hoistway.
 - 10. Provide inspection certificate in each car, mounted under acrylic cover with frame.

2.8 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LED lamps and acrylic or other permanent, nonyellowing translucent diffusers.

- B. Car Control Stations: Provide manufacturer's standard recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.
 - 1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

- C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station

has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

- D. Two-Way Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for two-way telephone communication service.
- E. Car Position Indicator: Provide illuminated car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows.
- F. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Provide units with flat faceplate for mounting with body of unit recessed in wall.
 - 3. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 - 4. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."
- G. Hall Lanterns: Manufacturer's standard wall-mounted units, for mounting above entrance frames indicating car arrival and direction of travel. Units with illuminated arrows; but provide single arrow at terminal landings.
- H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival.
- I. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.
- J. Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant white back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighters Phase I switch and hoistway access switches, with tamper resistant screws in same finish.

2.9 EMERGENCY OPERATIONS

- A. Emergency Recall:
 - 1. Main recall floor: 1st floor (Ground level)
 - 2. Alternate recall floor: 2nd floor
- B. Firefighter's Service:
 - 1. Phase I Recall Operation: all elevators.
 - 2. Phase II In-Car Operation: n/a.

2.10 ELEVATORS

- A. Elevator Description: one unit located in Clubhouse:
 - 1. Service: General-purpose Passenger
 - 2. Type: Twin-post above-ground holeless dual jack, single-stage hoist.

3. Rated Load: 3,500 lb
4. Rated Speed: 100 fpm.
5. Entrance Type: Front only, one-speed Side-Opening pair of sliding doors
6. Entrance Width: 42" clear
7. Entrance Height: 7'-0"
8. Car Inside Width: +/-6'-8" from side wall to side wall.
9. Car Inside Depth: +/-5'-5" from back wall to front wall.
10. Car Inside Height: +/-7'-4" to underside of ceiling

B. All Elevators:

1. Freight Loading Class for Service Elevators: Class A.
2. Application: Gearless Traction (Machine-Room-Less)
3. Pit Depth: 4'-0" min (verify up to 5'-0" with elevator manufacturer).
4. Control Space Location: Landing entrance wall above the lowest landing.
5. Power Supply: 480 Volts 3 Phase 60 Hz
6. Operation System: Microprocessor Single Car Automatic operation.
7. Auxiliary Operations:
 - a. Battery-powered lowering.
8. Car Enclosures:
 - a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - b. Car Fixtures: Upgraded vandal-resistant stainless steel
 - 1) Push-button illumination: white
 - c. Side and Rear Wall Panels: Verify with Architect and Owner, plastic-laminate panels basis of design, but upgrade options possible for specialty or custom wall panel materials.
 - d. Sheet Steel Base, Frieze, and Reveals: Powder-coat enamel.
 - e. Door Faces (Interior): Satin stainless steel, No. 4 finish
 - f. Door Sills: Aluminum, mill finish
 - g. Ceiling: Satin stainless steel panels with six LED recessed lights equally spaced per panel.
 - h. Handrails: one at rear of car, 4-inch flat bar satin stainless steel, No. 4 finish
 - i. Floor prepared to receive luxury vinyl plank, or thin-set ceramic tile floor finish.
9. Hoistway Entrances:
 - a. Fire-Protection Rating: 2 hours
 - b. Frames: Satin stainless steel, No. 4
 - c. Doors and Transoms: Satin stainless steel, No. 4 finish
10. Hall Fixtures: Satin stainless steel, No. 4 finish
 - a. Upgraded vandal-resistant where available.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame.
 - b. Verify clear height required for mounting hoist beam in shaft.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
 - 1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- C. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- D. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.
- E. Lubricate operating parts of systems as recommended by manufacturers.
- F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.
- H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- I. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes:
 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 2. Provide strippable protective film on entrance and car doors and frames.
 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 5. Do not load elevators beyond their rated weight capacity.
 6. Engage elevator Installer to provide full maintenance service during temporary use time, in addition to specified warranty time. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 142423

SECTION 211000 – FIRE PROTECTION

PART 1 - GENERAL

1.1 PROJECT SUMMARY

- A. Work in this Section includes but is not necessarily limited to providing all engineering and associated costs, calculations, labor, materials, supervision, testing, permits and approvals required to design, install and obtain final acceptance of the automatic fire protection sprinkler system complete in all respects.
- B. The fire protection system shall provide full and complete coverage of all areas and shall be compatible with the contract document layouts and avoid interference with work of all other trades in the building. Contractor shall provide offsets as needed to avoid other trades, including but not limited to mechanical ductwork, hydronic piping, structural elements and lighting. Contractor shall provide any additional heads, piping and appurtenances required in order to satisfy complete coverage of the building in accordance with NFPA.
- C. Provide fire protection system complete with all component equipment and material items. Install and test in full conformity with the requirements of all applicable codes, National Fire Protection Association (NFPA) 13 Edition.

1.2 RELATED SECTIONS – NOT USED

1.3 DEFINITIONS

- A. Working Plans: Documents, including shop drawings, calculations, and material specifications prepared according to NFPA 13 for obtaining approval from authorities having jurisdiction.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Sprinkler systems shall not be calculated to less than 5 psi or 10% below the actual water supply available, which ever is greater. Sprinkler plans and calculations must take into account and show elevation loss from the flow test location to the flowing sprinklers. Flow test information must be recent to within one (1) year previous to submittal of sprinkler drawings.
- B. NFPA standards require that the spray deflector of the sprinkler heads be installed eighteen (18") inches minimum above the top of the merchandise stored in piles, racks, shelves or displays.
- C. Sprinkler deflectors shall be positioned to avoid obstruction to both activation and discharge. Obstructions are (but are not limited to) lights, diffusers, ductwork, structural members (false or real), displayed signage or any object capable of impeding the proper activation and

discharge of the fire sprinklers. Installation shall comply to the referenced NFPA 13 document (Chapter 4) and the manufacturers listing. The sprinkler contractor shall be responsible for final coordination.

- D. All obstructions exceeding four (4') feet wide or which cannot be spaced around (to comply with 1.4.F) shall have sprinklers installed beneath the obstruction. If sprinklers are installed at or below 7'.6" they shall be equipped with a listed head guard.
- E. All sprinkler heads in finished ceilings shall be symmetrically spaced to provide proper coverage, and to avoid interference with lights, diffusers, grilles, or other ceiling mounted equipment. The head layout shall conform to the typical pattern.
- F. All overhead piping located in areas containing ceilings shall run concealed above the ceiling, without exception.
- G. Consult the bid specification drawings for acceptable locations for all piping to be run exposed (areas without ceilings).
- H. Inspector's tests to be provided with half-inch orifice, discharging at three (3") inches above a hard-paved surface. Provide pressure relief valves at inspector's test locations on all "grid" type systems. All inspector's test shall not be located behind racking or other obstructions and shall be located within eighteen (18") inches of an exterior door opening.
- I. Provide flushing and drainage as per required in NFPA 13.
- J. Provide fire department connection. The exact placement and model of the fire department connection shall be verified with the local jurisdiction. Refer to the provided fire sprinkler drawings for location and arrangement.
- K. System control valves accessed from the interior of the riser area and shall be tampered butterfly valves.
- L. Provide sprinkler protection at electrical rooms per the requirements of the local jurisdiction.
- M. The calculations shall include all sprinklers within the most hydraulically demanding area along each branch line within the distance determined using a 1.2 multiplier (times the square roof of the area).
- N. The contractor shall provide a valve connection discharging onto a paved (outside) surface, to allow full system demand to flow forward of the backflow preventor for testing. The test connection shall be capable of full system flow and shall not require system drainage or alteration. Note, the two (2") inch main drain and FDC are not acceptable.

1.5 SUBMITTALS

- A. The contractor shall submit complete shop (working) plans in all aspects in accordance with NFPA 13 (Chapter 6). Include complete calculations and all material data and engineering sheets including but not limited to:
1. Underground materials (pipe, fittings, valve, rod, etc.).
 2. Pipe and fitting.
 3. Hangers and supports.
 4. Seismic restraints.
 5. Valve(s) – any type.
 6. Alarm devices including electric.
 7. Fire department connections.
 8. Hose valves (if applicable).
 9. Sprinklers.
 10. Gauges.
 11. Flow Switches.
 12. Air Compressors.
- B. Fire Sprinkler shop drawings (2 sets of working plans, product data and hydraulic calculations) are to be submitted for review after the Engineer of record is satisfied that the shop drawings satisfy the requirements of the NFPA 13 and the project documents. The Engineer of record shall cite such approval on the shop drawings.
- C. Coordinate the sprinkler system to avoid interference with work of all other trades in the building. Examine the contract documents and make any modifications needed for a complete shop drawing.
- D. Submit shop drawings. Permit ample time for review and potential correction prior to start of work. No fabrication is permitted until approval is obtained.
- E. Submit revised drawings and calculations for review and approval as required to accommodate changes to the architectural plan and other contract documents during construction.
- F. Actual loss through any backflow devices must be accounted for in calculations. Sprinkler contractor shall submit, with their calculations and shop drawings a manufacturer's flow chart indicating pressure loss through the device(s) at the required flows.

PART 2 - PRODUCTS

2.1 GENERAL PARAMETERS

- A. All materials submitted and installed shall be UL listed, individually or as any assembly to be installed in a fire protection system.
- B. All materials shall be acceptable to all national and local applicable codes and standards.

2.2 SPRINKLER HEADS

- A. No sprinklers to be installed are permitted to have a rubber O-ring seal. Only metallic "spring seal" or equivalent seals are allowed.
- B. All sprinkler types and temperature ratings shall be as indicated on the drawings.

2.3 BRACKETS

- A. Brackets for attaching pipe hangers to building structure shall be the size and type for the intended use, and acceptable to the structural engineer in accordance with NFPA 13.

2.4 SWITCHES

- A. Provide all tamper and flow switches for indicating control valves and systems and as required by local ordinances.

2.5 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those indicated on drawings.

2.6 PIPE AND FITTINGS

- A. Ductile-Iron Pipe: AWWA C151, push-on-joint type, with cement-mortar lining and seal coat according to AWWA C104. Include rubber gasket according to AWWA C111.
- B. Ductile-Iron Pipe: AWWA C151, mechanical-joint type; with cement-mortar lining and seal coat according to AWWA C104. Include glad, rubber according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass, lugged caps, gaskets, and brass chains; brass, lugged swivel connection and drop clapper for each hose-connection inlet; eighteen (18") inch (460-mm) high brass sleeve; and round, floor, brass, escutcheon plate with marking "AUTO SPKR."

1. Finish Including Sleeve: Polished chrome plated.
 2. Finish Including Sleeve: Rough chrome plated.
 3. Finish Including Sleeve: Polished brass.
- C. Steel Pipe: ERW or CW schedule 10 or 40. All fittings shall comply with NFPA 13.
- D. CPVC: ASTM 437-439, Blazemaster or approved equal.

2.7 FIRE DEPARTMENT CONNECTIONS

- A. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250 psig (1725-kPa) pressure rating; and designed for horizontal or vertical installation. Include two (2) single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts 7A, 125-V ac and 0.25A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that send signal if removed.
- B. Pressure Switches: UL 753; electrical-supervision type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- C. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
- D. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw, with normally closed contacts, Include design that signals controlled indicator-post valve is in other than fully open position.

2.8 PRESSURE GAUGES

- A. Pressure Gauges: UL 393, 3 ½ to 4 ½ inch - (90 to 115 mm) diameter dial with dial range of 0 to 300 psig (0 to 1725 kPa).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Furnish and install under this Section all hangers and steel fabrications, other than building structure, required for proper support of piping and equipment.

3.2 HANGER ATTACHMENTS

- A. Support of pipes with diameter larger than 2 ½ inches may require modification of structural members to support increased loads. Suspend piping and equipment supported by building structure only by those methods, and only at those locations acceptable to the structural engineer.
- B. Provide supplementary supporting steel fabrication to bridge between structural steel fabrication to bridge between structural members to receive the hanger. Attach supplementary members to building structure only by those methods, and at those locations acceptable to the structural engineer.

3.3 INSPECTION, TESTING, AND CLEANING

- A. Arrange for all inspections, examinations and tests in full conformity with the requirements of all applicable codes, National Fire Protection Association (NFPA) standards and authority having jurisdiction necessary to obtain complete and final acceptance of the fire sprinkler system.
- B. Flush underground piping and pressure test at 200 psi for two (2) hours prior to connection to overhead piping. Flushing and testing shall be witnessed by the Fire Department.
- C. Leave entire sprinkler system clean in every respect at the conclusion of the work.
- D. Testing will occur after installation of all systems has been completed (approximately two (2) to three (3) weeks prior to opening). The contractor shall be required to provide a lift, air, and water pumps for system pressurization, and any necessary hand tools and apparatus for complete testing and draining of the systems. One (1) test of all systems should be completed within one (1) day. If all or any systems fail, the contractor shall be responsible to be present and furnish all items listed above until such time that systems are found to be acceptable or in accordance with NFPA 13, 25, and the bid documents. The contractor is responsible for notifying the Owner when installation is complete, and testing may begin. Please allow five (5) to ten (10) working days for scheduling.
- E. The contractor shall furnish to the owner a complete set of signed and witnessed test certificates for the following:
 - 1. Underground flushing.
 - 2. Underground hydrostatic test.
 - 3. Interior system hydrostatic test(s).
 - 4. All system trip tests.
- F. The Contractor shall train owner on use of all equipment and furnish two (2) copies to be left on site, of NFPA 25 the latest edition, and all apparatus manuals, please allow seven (7) days for scheduling.

3.4 WARRANTY

- A. Provide warranty in accordance with the General Conditions for a period of at least one (1) year.

END OF SECTION 211000

SECTION 220719 – PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- C. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.
- F. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.

- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER

- A. Insulation: ASTM C 547; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 850 degrees F (454 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Insulation: ASTM C 547; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 650 degrees F (343 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.
 - F. Insulating Cement/Mastic:
 1. ASTM C 195; hydraulic setting on mineral wool.
 - G. Indoor Vapor Barrier Finish:
 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
 - H. Outdoor Vapor Barrier Mastic:
 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
 - I. Insulating Cement:
 1. ASTM C 449/C 449M.
- 2.3 CLOSED CELL MOLDED
- A. Insulation: ASTM C 578; rigid closed cell.
 1. 'K' ('Ksi') value: 0.23 at 75 degrees F (0.033 at 24 degrees C).
 2. Maximum service temperature: 165 degrees F (74 degrees C).
 3. Maximum water vapor permeance: 5.0 perms (287 ng/Pa s sq m)
- 2.4 JACKETS
- A. PVC Plastic.
 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (-18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.00029 ng/Pa s sq m), maximum, when tested in accordance with ASTM E 96.
 - d. Thickness: 15 mil (0.38 mm).
 - e. Connections: Brush on welding adhesive.
 2. Covering Adhesive Mastic:
 - a. Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.

- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to drawings.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.3 SCHEDULES

A. Plumbing Systems:

- 1. Domestic Water Supply:
 - a. Closed Cell Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1/2 inch Cold Water except for Pex piping, 3/4" Hot Water.

B. Cooling and Heating Systems:

- 1. Cold Condensate Drains and drains accepting condensate: All sizes, Glass Fiber 1 1/2 ".
- 2. Refrigerant Suction: Closed Cell in accordance with Manufacturer's instructions.
- 3. Refrigerant Hot Gas: Closed Cell in accordance with Manufacturer's instructions.

END OF SECTION 220719

SECTION 221005 – PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Natural Gas.

1.2 REFERENCES

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).
- D. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM B 32 - Standard Specification for Solder Metal.
- F. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- G. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- H. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- I. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- J. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- K. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

- L. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
- M. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- N. AWWA C651 - Disinfecting Water Mains; American Water Works Association; (ANSI/AWWA C651).
- O. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- Q. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.
- R. ASTM D 1784 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.3 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with local standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.5 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with plumbing code.
- B. Conform to local requirements for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

1.8 EXTRA MATERIALS

- A. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 SANITARY AND STORM SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. PVC Pipe: ASTM D 2665 or ASTM D 3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.2 SANITARY AND STORM SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D 1785 Schedule 40, or ASTM D 2241 SDR 26 for not less than 150 psi (1034 kPa) pressure rating.
 - 1. Fittings: ASTM D 2466, PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement. Mechanical joint restraints on bottom 20' of vertical stacks and to 20' once turned horizontal (except buried).

2.3 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B 42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B 32, alloy Sn95 solder.

2.4 WATER PIPING, ABOVE GRADE

- A. CPVC Pipe: ASTM D 1784 Schedule 80.
 1. Fittings: ASTM D 1784, CPVC.
 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement.
- B. Polyethylene (PEX) Tubing: ASTM F876/F877.
 1. Fittings: ASTM F1281 Expansion Fittings
 2. Joints: Expansion.

2.5 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
 2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

2.8 GATE VALVES

- A. Up To and Including 3 Inches (80 mm): MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, threaded ends.

2.9 BALL VALVES

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends with union.

2.10 BUTTERFLY VALVES

- A. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 150 psi CWP, cast or ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, grooved ends, extended neck, infinite position lever handle with memory stop.

2.11 FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet, temperature and pressure test plug on inlet.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- P. Install water piping to ASME B31.9.
- Q. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- R. Sleeve pipes passing through partitions, walls and floors.
- S. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

T. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 099000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide flow controls in water recirculating systems where indicated.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in natural gas systems for shut-off service.

3.5 ERECTION TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.

- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum hanger spacing: 6.5 ft (2 m).
 - 2) Hanger rod diameter: 3/8 inches (9 mm).
 - b. Pipe size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).
 - c. Pipe size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 1/2 inch (13 mm).
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum hanger spacing: 4 ft (1.2 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).

END OF SECTION 221005

SECTION 230001 – MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 REFER TO DIVISION 1 FOR FULL PROJECT SCOPE OF WORK

1.2 MECHANICAL SCOPE OF WORK

- A. Heating, ventilating, air conditioning systems, plumbing, and other piping systems modifications as specified; complete and in operating order.
- B. Maintenance of heating and air conditioning equipment used for temporary heating, cooling, and for testing.
- C. Installation of all mechanical control components which require mechanical connections only, both mechanical and electrical connections, penetrations of air plenums and ducts, or installations into piping systems.
- D. All low voltage and line voltage control wiring, conduit, and devices for systems furnished under this division.
- E. Counterflashing of penetrations of roof or exterior walls by pipes, ducts, or other Work under this Division.
- F. Cutting and patching required due to omissions in the installation of Work under this Division, or due to failure to properly coordinate Work with other Divisions.
- G. Painting and labeling of pipe, ductwork, equipment, and devices furnished under this Division.
- H. Furnish access panels required for equipment furnished and installed under this Division.

1.3 RELATED ELECTRICAL WORK

- A. Wiring and conduit for electrical power shall be furnished and installed under Division 26.

1.4 OTHER RELATED WORK UNDER OTHER DIVISIONS

- A. Flashing of ducts and pipes into roofs and outside walls.
- B. Holes, chases, and recesses required for mechanical work.
- C. Miscellaneous steel including equipment supports.

MECHANICAL GENERAL PROVISIONS

1.5 CONFLICTS

- A. Designer shall be notified in writing at least ten (10) days prior to the Bid Date of any conflicts or items requiring clarification. Resolution shall be only by written notice from the Designer. Oral clarifications shall be confirmed in writing.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. The requirements listed below are given as a supplement to those in Division 1 and do not relieve the Contractor of complying with any and all applicable regulatory requirements set forth in this Specification.
- B. Obtain and pay for the required permits, inspection fees, tapping fees, connection charges, and utility company service charges.
- C. The mechanical work installation shall comply with State and local Health Departments and Building Codes, applicable Life Safety Code, State and local ordinances, and with NFPA Standard 90A and 90B.
- D. Equipment shall be U.L. listed. All installations shall comply with U.L. standards, where applicable.
- E. Equipment and Work shall comply with existing noise and safety standards.
- F. Certificates of compliance from authorities having jurisdiction shall be transmitted to the Engineer and the Owner. Complete all work, pay all fees, and arrange for tests to obtain certificates of compliance.

1.7 SUBMITTALS

- A. Submit to the Designer for review certified shop drawings on material furnished under this division as listed below. Submittal data shall be checked and stamped approved by the Contractor prior to his transmitting to the Designer. Refer to Division 1 for additional requirements.
- B. Submittals shall be bound in three-ring binders and indexed with a table of contents for each indexed section. Table of contents shall list item, manufacturer, and model number. Large drawings shall be attached to binder or inserted in pockets of binder.
- C. Submittal books shall be complete with all information required for this project prior to submittal. Submittals will be reviewed two (2) times only. The first review will include all items submitted. The second review will verify that comments noted on the first review have been resolved. Additional reviews required due to failure of Contractor to comply with Contract documents shall be at the Contractor's expense.

MECHANICAL GENERAL PROVISIONS

- D. Submittals shall contain rating data, accessories and features, the same as listed in specifications and capacities, shall be stated in the terms specified. Deviations from specifications and drawings shall be noted on the submittal. If none are noted, it shall be assumed the material meets the specified requirements fully.
- E. Where preprinted manufacturer's data describes more than one (1) product, mark submittals to indicate the specific product to be provided for this Project. Delete or mark out significant portions of pre-printed data which is not applicable. Where operating curves, graphs, etc. are required, mark the operating point or range for the Project.
- F. Requests for substitution of products not specifically named shall be submitted in writing a minimum of fourteen (14) calendar days prior to the bid date. Requests shall include section number, items, name of manufacturer to be substituted, and catalog data. Requests shall be reviewed only to approve or reject submission of detailed submittals as noted in other paragraphs of this Section.
- G. Acceptable manufacturers are noted in each section. Do not substitute materials, equipment, or methods unless such substitution has been approved in writing. Where the phrase "approved equal" appears, do not assume that materials, equipment, or methods will be approved until specific written approval has been given. The burden of proof for requested substitutions rests with the Contractor.
- H. Approved substitution requiring variations in quantity or arrangement of materials, or equipment from that specified, or indicated on drawings shall be furnished and installed by the Contractor at no additional cost to the Owner.
- I. Work shall not proceed until submittals for equipment and shop drawings have been approved. Work installed using unapproved substitutions shall be replaced at no additional cost to the Owner.

1.8 GUARANTEE, MAINTENANCE, AND OPERATING INSTRUCTIONS

A. Guarantee

Refer to Division 1 for additional requirements for guarantees.

- 1. Equipment shall be turned over to Owner clean and in complete working order with full one (1) year warranty by the manufacturer. Use of equipment for temporary heating or cooling shall not be included as part of the warranty period.

B. Maintenance

- 1. Work furnished and installed under this Division shall be maintained including inspection, lubrication, etc., in accordance with manufacturer's recommendations until acceptance of system by Owner.

C. Operating Instructions:

- 1. Refer to Division 1 for O & M Requirements.

1.9 RECORD DRAWINGS

- A. At completion of Work, prepare mechanical record drawings to accurate scale. Drawings shall indicate piping connections, other service connections, and interfaces with other Work including structural supports.
- B. Indicate portions of mechanical Work shown on record drawings which deviate from Work as indicated in the contract drawings and note the reasons for such deviations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230001

SECTION 230501 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK DESCRIPTION

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 - PRODUCTS

2.1 ELECTRICAL EQUIPMENT

- A. Motor controllers, protective devices, etc. for control and protection of equipment shall be furnished with the equipment; but installed and electrically connected to power source under "Electrical Division".
- B. NEMA Standards shall be taken as a minimum requirement for electrical equipment.
- C. Equipment shall operate properly under a 10% plus or minus frequency variation.
- D. Unless noted otherwise, motors shall be squirrel-cage induction type with ball bearings. Motors 1/2HP and smaller shall be 120 volts, single phase with permanently lubricated bearings; 3/4 HP and larger shall be 3 phase, general purpose, Design "B" or "C", drip proof type. Verify characteristics of available current at the building before equipment is ordered.
- E. Motors shall be in accordance with IEE, UL and NEMA Standards, non-radio interfering type, rated for continuous, full-load duty and capable of withstanding momentary overloads of 50%. Select motors so actual loads does not exceed nameplate rating, and does not use motor "service factor". "Open" motors shall be rated 40 degrees C.; "totally enclosed" type shall be 50-degrees C. rated. Motors over 5 HP shall be "high efficiency" type and so labeled.
- F. Provide both overload and under-voltage protection in all phases.
- G. Except where interlock or automatic control is required, single speed motors, and smaller than 1/2 HP have manual switch with pilot light and thermal overload protection. H. For manual operation of 3/4 HP and larger motors, furnish magnetic starter with:
 - 1. Maintained contact PB and pilot light or momentary contact pushbutton station and pilot when directed.
 - 2. Trip free, thermal overload relays.
 - 3. Capable of accepting electrical interlocks.

- H. Where interlock or automatic operation is specified, regardless of HP, provide magnetic starter complete with RUN/OFF/AUTO switch so connected that in "RUN" or "AUTO" all safety controls shall stop the motor.
- I. All magnetic starters shall have control circuits individually fused from line side of starter, or load side of breaker. All starters on service 200 volts and above shall have 120 volt, built-in control circuit transformer fused on line and load side.
- J. Provide dual element fused disconnect for all hermetic motors above 3/4 HP.
- K. Heating Equipment: Phase and voltage as noted or unless noted otherwise.
- L. Contactors shall be UL listed for 100,000 cycles of operation.
- M. Normal operation pilot lights shall be green; emergency condition signal lights shall be red.

2.2 EQUIPMENT ACCESSORIES

- A. AS NOTED UNDER SPECIFIC EQUIPMENT SCHEDULES AND SPECIFICATIONS.

2.3 ACCESS PANELS

- A. Provide access panels, or doors, at concealed dampers, valves, shock absorbers, vents, trap primers, inspection points, etc. and where noted. Panels shall be galvanized steel, 16 gauge frame, 14 gauge door with mounting accessories, spring hinges, screwdriver operated lock, and prime coat paint. Milcor "A" for acoustic tile, "M" for exposed masonry, "K" for plaster finishes, stainless steel for ceramic, or glazed structural tile. Where ceiling is "lift out" construction, ceiling access panels are not required. Panels shall be 18" x 18" or larger, as required for service intended.
- B. Access doors giving access to "live" electrical gear shall have switch to cut off power when opened.
- C. Access panels in fire rated construction shall have a UL label, Class B rating.

2.4 CONCRETE

- A. Where required for thrust blocks, pipe system encasement, equipment bases, etc. for Division 21, 22, and 23, provide 3,000 PSI concrete.

PART 3 - EXECUTION

3.1 ELECTRICAL WORK

- A. All electrical work shall be provided under "Electrical Division 26", except: (1) motor controls (2) interlock circuits, (3) control circuits, (4) temperature-humidity controls. For these excepted items, this division shall provide conduit, wiring, connections, etc. as required for a complete control installation according to the appropriate sections of Specifications.
- B. The work under this Division shall be of the same type and quality as specified under "Electrical Division".

3.2 EXCAVATION, SHORING AND BACKFILL

- A. Provide any excavation required for this Division below that needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate trench for each utility.
- C. Provide: (1) bracing, shoring, etc. to protect sides of excavation, (2) staging, suitable ladders, barricades, etc. Comply with local regulations, or absence thereof with Division of the Manual of Accident Prevention provided for in Construction of the AGC.
- D. Remove all timber before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill material shall be approved clay or chert, free of debris, rock larger than 1%" or other harmful material.
- E. All backfilling shall be compacted to 90% under sidewalks, or grass areas, and to 95% when under paved areas, structures, building slabs, steps, etc. These percentages refer to "Percent of Maximum Density" per ASTM #D-1557. If more stringent, compact backfill to a dry density equal to that required by G.C.
- F. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.

3.3 CUTTING AND PATCHING

- A. Provide all cutting, patching, etc. incidental to this work.
- B. Do not cut into any structural element without written approval of Structural Engineer.
- C. Patching shall be: (1) of quality equal to, and of appearance matching existing construction, and (2) shall restore all services and construction which remains in use to its condition prior to this contract, unless otherwise noted.

3.4 PIPING THRU RATED WALLS AND FLOORS

- A. Insulation on pipe passing thru fire rated walls must stop at pipe sleeve unless 3M fire barrier fire stopping is used. Space between pipe and sleeve shall be protected with 3M Fire Barrier Penetration Sealing System or approved substitute. Installation shall be in accordance with the manufacturers recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. Maintain vapor barrier on insulated chilled water and refrigerant suction piping.
- B. PVC pipe passing through rated walls or floors shall have 3M UL Modified Fire Stop System, Pro-Set System or Hilti.
- C. Refer to details on drawing for pipe and duct penetration thru rated walls and floors.

3.5 FLASHING

- A. Where pipes, ducts, etc. pass through roof, flash per manufacturers recommendations.
- B. Locate pipes, ducts, etc. through roof to clear parapets, etc. by at least 18".
- C. Provide flashing or caulking as required at each opening through outside walls or roof. Flashing through roof of same materials and methods as under "Moisture Protection Division"; through walls shall be aluminum unless noted otherwise.

3.6 PROTECTION

- A. Work shall be protected at all times. Pipe openings shall be closed with caps or plugs until permanent connections are made. Fixtures and equipment shall be covered if necessary, to protect against dirt, water, chemical or mechanical damage or defacement.
- B. All piping indicated to be installed above ceilings in walls or crawl spaces, shall be placed on the heated space side of the building insulation to prevent freezing. Piping indicated to be installed in areas outside heated envelope to be protected by the application of electric heat tape under pipe insulation. The Contractor shall be responsible in contacting the Architect/Engineer before installing and subjecting any piping to freezing conditions.

3.7 TEMPORARY WORK:

- A. Water and electricity consumed during construction shall be paid for by General Contractor.

END OF SECTION 230501

TESTING, ADJUSTING, AND BALANCING FOR HVAC

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCES

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

- A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the Engineer within two weeks after completion of testing, adjusting, and balancing.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

TESTING, ADJUSTING, AND BALANCING FOR HVAC

6. Units of Measure: Report data in I-P (inch-pound) units only.
7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Project altitude.
 - j. Report date.

- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.4 QUALITY ASSURANCE (moved to PART 3)

1.5 PRE-BALANCING MEETING (moved to PART 3)

1.6 SEQUENCING AND SCHEDULING (moved to PART 3)

1.7 WARRANTY (moved to PART 3)

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC MN-1, AABC National Standards for Total System Balance.
 2. ASHRAE STD 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 5. Maintain at least one copy of the standard to be used at project site at all times.

TESTING, ADJUSTING, AND BALANCING FOR HVAC

- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of 5 years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
- E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

TESTING, ADJUSTING, AND BALANCING FOR HVAC

3.3 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

TESTING, ADJUSTING, AND BALANCING FOR HVAC

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure.

3.7 SCOPE

- A. Test, adjust, and balance the following:
 - 1. All new systems
 - 2. Recirculation of Potable Hot Water Systems
 - 3. Heating/Cooling Units
 - 4. Air Handling Units
 - 5. Fans

TESTING, ADJUSTING, AND BALANCING FOR HVAC

6. Air Filters
7. Air Terminal Units
8. Air Inlets and Outlets

3.8 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

B. V-Belt Drives:

1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure

TESTING, ADJUSTING, AND BALANCING FOR HVAC

11. Discharge pressure
 12. Sheave Make/Size/Bore
 13. Number of Belts/Make/Size
 14. Fan RPM
 15. Total HW and CHW flow, specified and actual
- D. Return Air/Outside Air:
1. Identification/location
 2. Design air flow
 3. Actual air flow
 4. Design return air flow
 5. Actual return air flow
 6. Design outside air flow
 7. Actual outside air flow
 8. Return air temperature
 9. Outside air temperature
- E. Exhaust Fans:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Air flow, specified and actual
 6. Total static pressure (total external), specified and actual
 7. Inlet pressure
 8. Discharge pressure
 9. Sheave Make/Size/Bore
 10. Number of Belts/Make/Size
 11. Fan RPM
- F. Air Distribution Tests:
1. Air terminal number
 2. Room number/location
 3. Terminal type
 4. Terminal size

TESTING, ADJUSTING, AND BALANCING FOR HVAC

5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

G. Potable Water:

1. Location of circuit setter
2. Design Flow
3. Actual Flow

END OF SECTION 230593

SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C 553; flexible, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C 518.
 - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
 - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

- D. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Tie Wire: Annealed steel, 16 gage (1.5 mm).

2.3 GLASS FIBER, RIGID

- A. Insulation: ASTM C 612; rigid, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C 518.
 - 2. Maximum service temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Sorption: 5.0 percent.
 - 4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
 - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.4 JACKETS

- A. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
 - 1. Thickness: 0.016 inch (0.40 mm) sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms: Finish with aluminum jacket.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- G. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.3 SCHEDULES

- A. Supply and Fresh Air Ducts: Glass Fiber 2" Thick.
- B. Return and Relief Ducts in Mechanical Rooms: Glass Fiber, 1-1/2" Thick.
- C. Ducts Exposed to Outdoors: Glass Fiber 2-1/2" Thick.

END OF SECTION 230713

SECTION 233100 – HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Ductwork Cleaning.

1.2 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.
- E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.
- F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.6 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel.
- B. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
 - 4. For Use with Flexible Ducts: UL labeled.
- D. Hanger Rod: ASTM A 36/A 36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 MANUFACTURED METAL DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

2.4 KITCHEN HOOD DUCTWORK AND FITTINGS

- A. Provide in accordance with IMC 2012, NFPA 96 and details on design drawings. Maintain required slope and avoid cavities where grease can collect. Provide access doors for maintenance.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

- C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect terminal units to supply ducts with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- I. Connect diffusers or light troffer boots to low pressure ducts with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- J. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- K. Set plenum doors 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION 233100

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connections.
- H. Smoke dampers.
- I. Volume control dampers.

1.2 REFERENCES

- A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- B. NFPA 92A - Standard on Smoke-Control Systems; National Fire Protection Association.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.

1.3 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.4 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors, test holes, and all dampers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

1.7 EXTRA MATERIALS

- A. Provide two of each size and type of fusible link.

PART 2 - PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

- A. Gravity Backdraft Dampers, Size 18 x 18 inches (450 x 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

- B. Provide factory sleeve and collar for each damper.
- C. Multiple Blade Dampers: Fabricate with 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- D. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on exterior of duct and link to damper operating shaft.
- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices.
- F. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.6 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- B. Ceiling Dampers: Galvanized steel, 22 gage (0.76 mm) frame and 16 gage (1.5 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side with locking clip.
- C. Horizontal Dampers: Galvanized steel, 22 gage (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 2 inches (50 mm).
 - 2. Metal: 3 inches (75 mm) wide, 24 gage (0.6 mm) thick galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch (14 mm) thick, 0.87 lbs per sq ft (4.2 kg/sq m), 10 dB attenuation in 10 to 10,000 Hz range.

2.8 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 curtain type fire damper, normally open automatically operated by electric actuator.
- C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.9 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.
- B. Provide back draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated. Provide 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 233300

SECTION 233700 – AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

1.2 REFERENCES

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.
- B. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

1.3 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

PART 2 - PRODUCTS

- 2.1 ROUND CEILING DIFFUSERS – See Drawings
- 2.2 RECTANGULAR CEILING DIFFUSERS – See Drawings
- 2.3 CEILING EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings
- 2.4 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings
- 2.5 LOUVERS
 - A. Type: 4 inch (100 mm) deep with blades on 45 degree slope, heavy channel frame, 1/2 inch (13 mm) square mesh screen over exhaust and 1/2 inch (13 mm) square mesh screen over intake.
 - B. Fabrication: 16 gage (1.50 mm) thick galvanized steel welded assembly, with factory baked enamel finish, color to be selected.
 - C. Mounting: Furnish with screw holes in jambs for installation.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. Install in accordance with manufacturer's instructions.
 - B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
 - C. Install diffusers to ductwork with air tight connection.
 - D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
 - E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 233700

SMALL SPLIT-SYSTEM HEATING AND COOLING

SECTION 237655 – SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Air-source heat pumps and cooling units.
- B. Air cooled condensing units.
- C. Indoor air handler (fan & coil) units for non-ducted and ducted connections.

1.2 REFERENCES

- A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning and Refrigeration Institute.
- B. ARI 520 - Positive Displacement Condensing Units; Air-Conditioning and Refrigeration Institute.
- C. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- D. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- E. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- F. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

1.3 SUBMITTALS

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

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- C. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
 - 1. Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 as indicated on drawings; seasonal efficiency to ASHRAE Std 103.
- C. Electrical Characteristics:
 - 1. Disconnect Switch: Provided under Division 26.

2.2 INDOOR UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.

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- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
 - 2. Manufacturers: System manufacturer.
- E. Furnaces: UL listed and manufactured integral to air handling unit at listed capacities on schedules.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Ceiling Cassette Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Four-way 2'x2' ceiling-cassette indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability as specified. Wide air-flow pattern with ventilation air intake knockout. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Automatic fan speed control; auto restart following a power outage. Auto wave airflow in heating mode—unit independently cycles through horizontal and vertical positions for more even heat distribution.
- B. Indoor Wall Mounted Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Wall mounted indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability where specified in heat pump configuration. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Auto restart following a power outage.
- C. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.

2.4 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Compressor: ARI 520; hermetic, two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor

SMALL SPLIT-SYSTEM HEATING AND COOLING

overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion and reversing valves for heat pump operation.
- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting. Thermostat shall allow occupied and unoccupied settings from BAS and have an occupied mode override. Provide outdoor coil defrost control. Unit shall be capable of operating with automatic changeover in cooling or reverse cycle heating, and auxiliary heating modes.
- E. Unit shall be capable of operating to 0 degrees F.

2.5 AUXILIARY HEAT/ELECTRIC FURNACE COMPONENTS

- A. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental stages of 5 kW each, with porcelain insulators.
- B. Operating Controls:
 - 1. Heater stages energized in sequence with pre-determined delay between heating stages.
 - 2. High limit temperature control to de-energize heating elements, with automatic reset.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION 237655

SECTION 260500 – ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide all materials, labor, and equipment required to furnish and install a complete electrical system as indicated on the Drawings and as specified herein.
- B. Electrical work includes, but is not limited to, the following:
 - 1. Expand the distribution system for lighting and power including the necessary feeders, panelboards, branch circuits, conduit, lighting fixtures, control switches, and receptacles.
 - 2. Grounding.
 - 3. Telephone system raceways and boxes.
 - 4. Power wiring for equipment furnished under Division 21, 22 and 23.

1.2 RELATED WORK

- A. The following work shall be furnished under other Divisions of these Specifications, but shall be coordinated with said Divisions by Division 26 tradesman prior to bid.
 - 1. Flashing of conduits into roofing and outside walls.
 - 2. Painting.
 - 3. Cutting and patching.
 - 4. Heating, ventilating, air conditioning, and plumbing equipment.

1.3 DEFINITIONS

- A. Provide: Shall mean "furnish, install, connect, and put in good working order."
- B. Wiring: Shall mean "wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. completely installed."
- C. Engineer: Shall mean "Engineer of Record" whose seal is affixed to the contract specifications and drawings of Division 26.

1.4 CODES AND STANDARDS

- A. Comply with applicable local, state, and federal codes.

ELECTRICAL GENERAL PROVISIONS

- B. Electrical work shall be installed in accordance with the Drawings and Specifications, the 2017 NEC, 2018 IBC, applicable accessibility code and NFPA.
- C. In event of conflict between Drawings, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling will then be made by the Engineer in writing. All work shall be installed in strict accordance with applicable codes without additional cost to Owner.
- D. Contractor shall submit and/or file all necessary specifications and drawings as required by governing authorities.

1.5 SUBMITTALS

- A. Provide submittals on materials and equipment identified in the Specifications and Drawings prior to manufacturer, order, or installation in accordance with Shop Drawings, Product Data, and Samples.
- B. Submittals shall include but not be limited to the following:

Lighting fixtures

Panelboards

Meter Center

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SITE VISIT

- A. Visit job site prior to bid date to determine actual conditions under which work shall be done, to become familiar with project, and to verify total scope of work required. Failure to do so shall not constitute a reason for an extra charge.

END OF SECTION 260500

BASIC ELECTRICAL MATERIALS AND METHODS

SECTION 260501 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: All materials and equipment used in work of Division 26 shall be produced by manufacturers regularly engaged in manufacturer of similar items and with history of successful production acceptable to the Engineer. They shall be new and be UL listed and labeled or listed and labeled by other recognized testing laboratory where such label is available.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this Section.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Reference in Specifications to any article, device, product, material, fixture, form and type of construction, by name, make, or catalog number shall be interpreted as established standard of quality and shall not be construed as limiting competition. Any article, device, product, material, fixture, form and type of construction which in the judgment of Engineer, expressed in writing, is equal to that specified, may be used.
- B. Substitution shall be approved by Engineer before purchase and/or installation. If unapproved materials are installed, work required to remove and replace unapproved items shall be done at the Contractor's expense.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Electrical drawings are diagrammatic and shall not be scaled for exact sizes or locations. They are not intended to disclose absolute or unconditional knowledge of actual field conditions.
- B. Equipment shall be installed according to manufacturer's recommendations.
- C. Protect work and materials from damage by weather, entrance of water, and dirt. Cap conduit during installation. Avoid damage to materials and equipment in place.

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- D. Satisfactorily repair or remove and replace damaged work with new materials.
- E. Trenching and backfilling shall comply with Site Work of these Specifications and provide sheathing, shoring, dewatering and cleaning necessary to keep trenches and their grades in proper condition for work to be carried on. Trenches shall be excavated 6" below elevation of bottom of conduit. Backfill shall be per Site Grading and Filling.
- F. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available space in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring services shall be readily accessible.
- G. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
 - 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, whether exposed or concealed.
 - 10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - 11. Install access panels or doors where units are concealed behind finished surfaces.

BASIC ELECTRICAL MATERIALS AND METHODS

12. Insulate dissimilar metals so they are not installed in direct contact.

- H. Conduits which pass through floor slabs (except ground floor) shall be sealed with Fire Stop Sealant. Seal around conduits or other wiring materials passing through partitions, floors, and fire rated walls. Use UL approved Fire Stop Sealant as detailed on the drawings.
- I. Coordinate electrical power connection requirements with all equipment suppliers. Where power requirements differ from drawing design requirements, Engineer shall be notified for clarification and installation requirements prior to installing that portion of work. Cost for equipment and labor for improperly installed electrical connections not coordinated and approved by other trades and the Engineer shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of rework.

3.2 CUTTING AND PATCHING

- A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

3.3 TESTING AND EQUIPMENT SERVICING

- A. Entire installation shall be free from improper grounds and short or open circuits. Conductors shall be tested before energizing circuit. Test to insure that entire system is in proper operating condition, and that adjustments and settings of circuit breakers, fuses, control equipment, and apparatus have been made. Correct defects discovered during tests.

3.4 REMOVAL OF DEBRIS

- A. Remove surplus materials and debris caused by, or incidental to electrical work. Remove such debris at frequent intervals. Keep job site clean during construction.

3.5 IDENTIFICATION OF EQUIPMENT

- A. Equipment shall be identified in accordance with Section 260553, "Electrical Identification."

3.6 AS-BUILT DRAWINGS

- A. Maintain one set of blue line electrical prints on site, marked to show as-built conditions and installations, prints to be turned over to Owner after job is complete.

3.7 TEMPORARY LIGHTING AND POWER

- A. Not Required

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3.8 POWER OUTAGES

- A. Coordinate all power outages with Owner and submit for approval proposed schedule of work indicating extent, number, and length of outages required to perform work. Contractor shall include in bid cost of overtime labor required for power outage to occur after Owner's normal hours of operation.

3.9 OTHER MATERIALS

- A. Work of this Division shall also include those items not specifically mentioned or described, but which are obviously necessary to conform to the design intent, applicable codes and to produce complete electrical system that functions properly. These materials shall be as selected by Contractor but subject to approval of the Engineer.

3.10 OTHER COORDINATION

- A. Contractor shall obtain and pay for all necessary permits and inspection fees required for the electrical installation.

3.11 GUARANTEE-WARRANTY

- A. Guarantee work to be free of material and workmanship defects for a period of one year, from date of final acceptance for the project. Repair and replace defective work and other work damaged thereby which becomes defective during term of Guarantee-Warranty. Furnish Owner with three written copies of Guarantee-Warranty.

END OF SECTION 260501

SECTION 260516 – CONDUIT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide a complete conduit system to support all electrical equipment and systems. Conduit system includes conduit, couplers, connectors, fittings, boxes, covers and supports.
- B. No conduit serving branch circuits shall be installed in or below concrete slabs unless required for branch circuits serving loads located in the center of a room.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide conduit that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Conduit and its installation shall comply with requirements of the National Electrical Code.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Electric Metallic Tubing (EMT): Allied, Wheatland, LTV Copperweld.
- B. Rigid Metal Conduit (RMC): Allied, Wheatland, Republic.
- C. Flexible Steel Conduit (Greenfield): Alfex, Electroflex.
- D. Rigid Non-Metallic Conduit (PVC): Carlon Schedule 40, Cantex, Southern Pipe, Schedule 80.
- E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Alfex, Electroflex.

2.2 CONDUIT FITTINGS

- A. Couplings and connectors: Appleton, T&B, Arlington, or O.Z. Gedney.
- B. Bushings: Appleton, T&B, O.Z., or Gedney

- C. Straps and Hangers: Appleton, T&B, Steel City, or Minerallac.
- D. Group Pipe supports: Unistrut, Kindorf, B-Line.
- E. Expansion Fittings: O.Z. Gedney Type AX, or equal by Appleton.
- F. Exposed Conduit Fittings: Appleton, Crouse-Hinds, or O.Z. Gedney.

PART 3 - EXECUTION

3.1 CONDUIT

- A. In general, conduit installation shall follow layout shown on drawings. However, this layout is diagrammatic only and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without cost to Owner. Offsets in conduits are not indicated and must be furnished as required.
- B. Conduit shall be installed in accordance with the National Electrical Code.
- C. Provide bushings on the open ends of conduit containing conductors. Insulated bushings shall be provided for conduits containing conductors #4 AWG or larger with an insulating ring an integral part of the bushing.
- D. Use EMT where Drawings call for conduit to be concealed in walls or above ceilings or when cast in concrete slabs not on grade. Do not use EMT exposed in wet locations, or in exterior applications.
- E. Use Schedule 40 PVC when installed underground. Use Schedule 80 PVC when exposed.
- F. When PVC conduit is used, turn up perpendicular to slab.
- G. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of water during concrete pouring and at other times during construction, prior to completion of conduit installation.
- H. Route all conduit at right angles or parallel to walls of building.
- I. Use proper sized tools for bending. Do not heat metal conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.
- J. Minimum conduit size 1/2" unless otherwise required.
- K. Leave one #10 AWG or equivalent nylon pull wire in empty conduits.

CONDUIT

- L. Use short pieces, approximately five (5') feet of flexible conduit to connect motors and other devices subject to motion and vibration. Use liquid tight flexible conduit where outside or subject to water spray.

3.2 CONDUIT FITTINGS

- A. When EMT is installed concealed in walls or above ceilings use steel double set screw connectors. All connectors shall have throated insulating bushing.
- B. Support conduit vertically and horizontally by straps or hangers. Do not exceed intervals as described in the National Electrical Code.
- C. Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel cans.

END OF SECTION 260516

SECTION 260519 – WIRE AND CABLE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Wire and cable for all service, feeders, branch circuits, and instrument and control wiring rated 600 volts and below.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wire and cable and its installation shall comply with requirements of the National Electrical Code.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wires and cables shall meet applicable requirements of the National Electrical Code and UL for the type of insulation, jacket, and conductor specified or indicated.
- B. All conductors shall be copper with 600 volt insulation unless otherwise indicated. Use type NM cable for branch circuit wiring. Provide nail plates where required by the NEC.
- C. Wire and cable shall be manufactured by Belden, General Cable, Essex, Encore, Rome Cable, Southwirel.
- D. Use solid copper type THHN/THWN for branch circuit wiring #10 AWG and smaller. No conductor for branch circuit wiring shall be smaller than #12 AWG.
- E. Use stranded copper, type THHN/THWN for feeder and power circuits #8 AWG and larger.
- F. Provide color coded wire and with a different color for each phase and neutral and ground as follows: 120/240 volt circuits - phases A, B,: black and red, respectively; neutral: white; ground: green. Approved color tape is acceptable for feeders.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Complete conduit system before pulling any wire or cable. Use cable lubricants recommended by cable manufacturer as necessary.
- B. Conductors shall be continuous from outlet to outlet or to branch circuit over-current devices. Make splices only in junction boxes. Splices shall not be made in panelboards. Control wiring shall be continuous between components and/or terminal boards.
- C. A minimum of eight (8") inches of slack conductor shall be left in every outlet or junction box. There should also be enough slack so three (3") inches extends outside the outlet or junction box.
- D. Make splices in conductors #10 AWG and smaller diameter with insulated, pressure-type connector. Use Scotchlok, or Ideal wire connectors.
- E. Make splices in conductors #8 AWG and larger diameter with solderless connectors and cover with insulation material equivalent to conductor insulation. Use Burndy compression connectors with crimpit cover, type CC.

3.2 TESTING

- A. After completion of the installation and splicing and prior to energizing the conductors, wire and cable shall be given continuity and insulation tests as herein specified.
- B. Test wiring to verify that no short circuits, open circuits, or accidental grounds exist. Continuity tests shall be conducted using a dc device with bell or buzzer.
- C. Perform megger tests on wiring #4 AWG and larger.

END OF SECTION 260519

SECTION 260526 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Equipment grounding conductors.
- B. Bonding.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide grounding and bonding materials that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Components and installation shall comply with the requirements of the National Electrical Code (NEC).
- C. Materials shall comply with UL 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers shall be Burndy or T&B.

2.2 CONNECTORS

- A. Exothermic welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- B. Pressure connectors shall be high-conductivity-plated units.
- C. Bolted clamps shall be heavy-duty units listed for the application.

2.3 WIRE AND CABLE

- A. All grounding conductors shall be copper.

- B. The grounding electrode conductor shall be stranded.
- C. Equipment grounding conductors shall have green insulation.
- D. Bare copper conductors shall conform to the following:
 - 1. Solid conductors: ASTM B-3
 - 2. Assembly of stranded conductors: ASTM B-8
 - 3. Tinned Conductors: ASTM B-33

2.4 MISCELLANEOUS CONDUCTORS

- A. Ground bus shall be bare annealed copper bars.
- B. Braided bonding jumpers shall be copper tape, braided number 30 gauge bare copper wire, and terminated with copper ferrules.
- C. Bonding strap conductor/connectors shall be soft copper, 0.05 inch thick and two (2") inches wide, unless otherwise noted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grounding system shall be in accordance with Article 250 of the NEC except where the Drawings or Specifications exceed NEC requirements. Each building to be provided with a grounding electrode system.
- B. Install code size green grounding conductors in all feeder and branch circuits. Bond conductors to chassis or fixed equipment.
- C. All grounding conductors shall be bonded to multi-terminal ground bus at panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.
- D. Provide a grounding electrode system at each building consisting of ground rods, and grounding electrode conductors in accordance with NEC. Bond all metallic piping systems, reinforcing steel and foundation steel.

3.2 CONNECTIONS

- A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 2. Make connections with clean bare metal at points of contact.
 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. For compression-type connections, use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- E. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in each piece of flexible conduit, and screw to conduit system with lugs at both ends.

3.3 FIELD QUALITY CONTROL

- A. Perform continuity tests at all power receptacles to ensure the ground terminals are properly grounded to the facility ground network.

END OF SECTION 260526

SECTION 260529 – SUPPORTING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fasteners.

1.2 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the National Electrical Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, Slotted Metal Angle and U-Channel Systems shall be provided by Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Unistrut Diversified Products.
- B. Subject to compliance with requirements, Conduit Sealing Bushings shall be provided by Bridgeport Fittings, Inc., Cooper Industries, Inc., Killark Electric Mfg. Co., O-Z/Gedney, Raco, Inc., Spring City Electrical Mfg. Co., or Thomas & Betts Corp.

2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be aluminum or hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Raceways shall be supported with clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:

1. Expansion Anchors: Carbon steel wedge or sleeve type.
 2. Toggle Bolts: All steel springhead type.
 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.4 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. over 6-inch: 14-gauge.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
 - 1. Conform to manufacturer's recommendations for selection and installation of supports.
 - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs., provide additional strength until there is a minimum of 200 lbs. safety allowance in the strength of each support.
 - 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 - 6. Space supports for raceway types not covered by the above in accordance with NEC.
 - 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 - 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with manufacturer's recommendations.

- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 - 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 - 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION 260529

SECTION 260533 – OUTLET AND JUNCTION BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide outlet and junction boxes that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Outlet and junction boxes and their installation shall comply with the requirements of the National Electrical Code.

PART 2 - PRODUCTS

2.1 OUTLET AND JUNCTION BOXES

- A. Outlet and junction boxes shall be galvanized steel, 1-1/2" deep minimum by Raco, T&B/Steel City, or Crouse Hinds.
- B. Boxes for interior areas with exposed conduit shall be pressed steel and in exterior areas with exposed conduit shall be cast metal with threaded hubs, "FS" type. Use galvanized steel for concealed boxes.
- C. Boxes in wood framed walls may be plastic where used with type NM cable. Boxes shall be extra hard shell, 2 hour rated, where located in fire walls.

PART 3 - EXECUTION

3.1 GENERAL

- A. Outlet and junction boxes in inaccessible ceiling areas shall be located no more than 6 inches from ceiling access panel or from removable recessed luminaire.

- B. Install boxes to preserve fire resistance rating of partitions and other elements, using UL listed fire stop materials and methods.
- C. Do not install flush mounted boxes back-to-back in walls; provide minimum six (6") inches separation. Provide minimum twenty-four (24") inches separation in fire rated walls.
- D. Do not fasten boxes to ceiling support wires.
- E. Support boxes independently of conduit.
- F. Bonding jumpers shall be used around knockouts.

3.2 OUTLET BOXES

- A. Outlet boxes shall be securely anchored, set true, and plumb and no part of box shall extend beyond finished wall or ceiling. Flush mounted boxes shall be set to within 1/8" of finished wall and a plaster ring used to make cover flush with wall.
- B. Select boxes according to intended use and type of outlet. Ceiling outlet boxes shall be four (4") inches octagon and 2-1/2" deep. Use four (4") inches square boxes where required. All ceiling outlet boxes shall have a fixture stud of the no bolt, self-locking type if required to hang the fixture specified at the outlet.
- C. Receptacle and switch boxes installed in concrete block walls not plastered shall be Steel City, Appleton, Raco Series No. 690 through No. 699, or approved equal masonry boxes of proper depth and gang required and specifically designed for this purpose. If more than two conduits enter box from one direction, 4" square boxes with square-cut device covers not less than one (1") inch deep specifically designed for this purpose, shall be used. Round edge plaster rings will not be acceptable for block walls. Sectional or gangable type outlet boxes will not be acceptable except in drywall construction.
- D. Mount outlet boxes worked to nearest block course. Confirm ADA compliance.
- E. Install blank device plates on outlet boxes left for future use.
- F. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Confirm accessibility code compliance.

3.3 JUNCTION BOXES

- A. Pull and junction boxes shall be sized in accordance with the National Electrical Code according to number of conductors in box or type of service to be provided. Minimum size is 4-11/16" square and 2-1/2" deep.

OUTLET AND JUNCTION BOXES

- B. Pull boxes shall be provided where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with bends exceeding 270 degrees shall have a pull box installed at a convenient intermediate location.
- C. Install in locations as shown on Drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- D. Install pull and junction boxes above accessible ceilings and in unfinished areas only.

3.4 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION 260533

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Extent and types of electrical identification are indicated herein and as follows:
1. Operational instructions and warnings.
 2. Danger signs.
 3. Equipment/system identification signs.
 4. Conduit identification.
 5. Power and control wiring identification.
 6. Terminal marking.
 7. Arc-flash warning.
 8. Panelboard Legends.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, identification products shall be provided by W.H. Brady Co., Ideal Industries, Inc., Panduit, or T&B.

2.2 MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Cable/Conductor Identification Bands: Provide manufacturer's standard wrap-around type, vinyl-cloth, self-adhesive cable/conductor markers with either pre-numbered plastic coated type or write-on type with clear plastic self-adhesive cover flap, numbered to show circuit identification. Provide markers for all field control wiring.
- C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings. Signs shall be of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN or DANGER – HIGH VOLTAGE).

1. Colors: Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- D. Engraved Plastic-Laminate Signs: Provide three-layer engraving stock in sizes and thickness indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 1. Thickness: 1/16", for units up to 20 sq. in. or eight (8") length; 1/8" for larger units.
 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- E. Underground Warning Tape: Provide four (4") inch wide detectable type, plastic, yellow warning tape with suitable warning describing type of cable/circuit over buried electrical lines.

2.3 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations, and other designations used in electrical identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering, and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
 1. Coordination: Where identification is to be applied to surfaces, which require finish, install identification after completion of painting.
 2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
 3. Conduit Identification: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange as coded color for conduit.
 4. Equipment/System Identifications: Install engraved plastic-laminate sign on each disconnect and control cabinets. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide identification and warning signs for each unit of the following categories of electrical work.
 - a. Electrical cabinets and enclosures.

- b. Panelboards
- c. Disconnect switches.

END OF SECTION 260553

SECTION 260573 – OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes circuit breakers and fuses.

1.2 SUBMITTALS

- A. Provide manufacturer's product data for the following:
 - 1. Circuit breakers
 - 2. Enclosures
 - 3. Fuses (Provide complete list of all fuses and the equipment where they are used.)
- B. Provide maintenance data for products for inclusion in the Operating and Maintenance Manual.
 - 1. Include a load current and overload relay heater list compiled by Contractor after motors have been installed. Arrange list to demonstrate selection of heaters to suit actual motor nameplate full load currents.

1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide overcurrent protective devices that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Overcurrent protective devices and their installation shall comply with the requirements of the 2008 National Electrical Code.
- C. Circuit breakers shall comply with UL 489, NEMA AB 1, and NEMA AB 3.
- D. Fuses shall conform to NEMA FU 1.

OVERCURRENT PROTECTIVE DEVICES

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Circuit Breakers: Subject to compliance with requirements, provide products by Cutler-Hammer; General Electric Co.; Siemens Energy & Automation, Inc.; or Square D Co.
- B. Fuses: Subject to compliance with requirements, provide products by Bussmann Mfg. Co., Littlefuse Co, or Ferraz Shawmut.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case, manually operated, trip-free, with inverse-time, thermal-overload protection, and instantaneous magnetic, short-circuit protection, as required. Circuit breakers shall be completely enclosed in a molded case, with the calibrated sensing element factory-sealed to prevent tampering.
- B. Thermal-magnetic tripping elements shall be located in each pole of the circuit breaker and shall provide inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection.
- C. Breaker size shall be as required for the continuous current rating of the circuit. Breaker class shall be as required.
- D. Interrupting capacity of the branch circuit breakers shall be sufficient to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Circuit breaker minimum interrupting capacities shall be as shown on drawings and shall conform to NEMA AB 3.
- E. Multipole circuit breakers shall be of the common-trip type having a single operating handle and shall have a two-position on/off indication. Circuit breakers shall have temperature compensation for operation in an ambient temperature of 104 degrees F. Circuit breakers shall have root mean square (rms) symmetrical interrupting rating sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).
- F. Breaker body shall be of phenolic composition. Breakers shall be capable of having such accessories as handle-extension, handle-locking, and padlocking devices attached where required.
- G. Provide UL listed service entrance equipment when used for service disconnect.
- H. Circuit breakers used for switching high intensity discharge lights or fluorescent lights shall be rated for that type of service.

OVERCURRENT PROTECTIVE DEVICES

2.3 ENCLOSED MOLDED-CASE CIRCUIT BREAKERS

- A. Enclosed circuit breakers shall be thermal-magnetic, molded-case circuit breakers in surface-mounted, nonventilated enclosures, conforming to the appropriate articles of NEMA 250 and NEMA AB 1.

2.4 FUSES

- A. A complete set of fuses for all switches shall be provided. Fuses shall have a voltage rating not less than the circuit voltage.
- B. Provide Class RK5 fuses for motor branch circuits.
- C. Fuses shall be labeled showing UL class, interrupting rating, and time-delay characteristics, when applicable.
- D. Fuse holders field-mounted in a cabinet or box shall be porcelain. Field installation of fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber shall not be used.
- E. Provide a minimum of three (3) spare fuses of each size and type fuse installed.
- F. Provide a complete list of all fuses and the equipment where they are used.

2.5 EQUIPMENT ENCLOSURES

- A. Enclosures for equipment shall be in accordance with NEMA 250.
- B. Equipment installed inside, clean, dry locations shall be contained in NEMA Type 1, general-purpose sheet-steel enclosures.
- C. Equipment installed in wet locations shall be contained in NEMA Type 3R, rainproof, sheet-steel enclosures, constructed for outdoor use to protect against falling rain, sleet, and ice.
- D. Ferrous-metal surfaces of electrical enclosures shall be cleaned, phosphatized, and painted with the manufacturer's standard finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements.

OVERCURRENT PROTECTIVE DEVICES

- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices.
- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.
- D. Install enclosed circuit breakers plumb with operating handle at five (5') feet above finished elevation.

3.2 ADJUSTING

- A. Inspect circuit breaker operating mechanisms for malfunctioning and adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- A. Prior to energizing overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.
- B. In the presence of the Owner or Owner's Representative, test each device and demonstrate its working as specified.

END OF SECTION 260573

MECHANICAL EQUIPMENT AND CONTROLS

SECTION 262400 – MECHANICAL EQUIPMENT AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of contract, including general and supplementary conditions and general requirements apply to work specified in this section.

PART 2 - PRODUCTS

2.1 STARTERS

- A. All starters for Division 22 and 23 package mechanical equipment will be furnished by Division 22 and 23, but installed and connected by Division 26

2.2 CONTROL WIRING

- A. All control wiring for mechanical equipment shall be provided in conduit under each respective division. Control components for mechanical equipment will be furnished and installed by Division 22 and 23.

2.3 POWER WIRING

- A. All power wiring at 120 and 240 volts shall be provided by Division 26.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate electrical power connection requirements with Mechanical Contractor. Where power requirements differ from drawing design requirements, Engineer shall be notified in writing. Contractor shall be given clarification and installation requirements prior to installation of the portion of work. Cost of equipment and labor for improperly installed electrical connections not coordinated and approved by Engineer and Mechanical Contractor shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of any rework.

END OF SECTION 262400

SECTION 262726 – WIRING DEVICES AND PLATES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Switches
- B. Receptacles
- C. Plates

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wiring devices and plates that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wiring devices and plates and their installation shall comply with the requirements of the National Electrical Code.

PART 2 - PRODUCTS

2.1 SWITCHES

- A. Switches shall be toggle, quiet-type with totally enclosed with bodies of thermoplastic and mounting strap. Color shall be selected by architect.
- B. Switches shall be rated for 20 amps, 277 volts AC. Switches shall be specification grade Hubbell, P&S, Leviton, or Cooper Wiring Devices.

2.2 RECEPTACLES

- A. Receptacles shall be general purpose, heavy duty, tamper resistant and weather resistant (where located outside) duplex receptacles with bodies made of thermoplastic supported on a metal mounting strap in accordance with NEMA WD 1. Receptacles shall be 20 amp, 125 volt, specification grade Cooper Wiring Devices, Hubbell, Leviton, P&S. Color shall be selected by architect.

- B. Ground fault circuit interrupter receptacles shall be the “feed-through” type rated to protect 20 amps. Receptacles shall be specification grade tamper resistant duplex receptacles with an impact-resistant nylon face with test and reset buttons. Color shall be selected by architect.
 - 1. 20 Amp, 125 Volt: Cooper Wiring Devices, Hubbell, Leviton, or P&S.
- C. Special Receptacles: As indicated on Drawings.

2.3 PLATES

- A. Provide UL listed, one-piece device plates to suit the devices installed.
- B. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast-metal having round or beveled edges.
- C. Plates on finished walls shall be nylon, mid-size.
- D. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine-type with countersunk heads in color to match finish of plate.
- E. Plates installed in wet locations shall be gasketed and UL listed for “wet locations” as per NEC 406.8 (B).
- F. Modular plates for data, cable television, and telephone by others.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide proper size outlet boxes for all wiring devices in accordance with Section 260533, “Outlet and Junction Boxes.”
- B. Install switches forty-eight (48") inches above finished floor on lock side and clear of door frame a minimum of three (3") inches unless otherwise noted. Prior to rough-in, coordinate with architectural drawings to determine lockside of door.
- C. All switches shall be made by the same manufacturer.
- D. Where two or more snap switches are to be installed at the same location, they shall be mounted in one-piece ganged switch boxes, with at gang cover plate.
- E. Combination snap switch and single or duplex receptacles shall be mounted in two-gang switch box with one-piece device plate.
- F. Receptacles shall be mounted 18" above finished floor unless otherwise noted.

- G. All wiring devices shall be mounted in accordance with accessibility code requirements.
- H. The finish of devices and coverplates shall be selected by the architect.

END OF SECTION 262726

SECTION 266100 – GENERAL LIGHTING PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Fixtures
- B. Controls
- C. Lamps
- D. Ballasts/Drivers
- E. Exterior Fixtures
- F. Emergency Lighting

1.2 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 260500.
- B. Submit shop drawings for luminaries showing pertinent physical characteristics and performance data.
- C. Submit samples of luminaries prior to final production at Engineer's request on any proposed fixture substitution.
- D. Provide a complete set of fixture information and include in O&M Manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide fixtures as shown in the fixture schedule.

2.2 FIXTURES

All LED fixtures shall have the following characteristics:

- A. Minimum color rendering index (CRI) of 80

GENERAL LIGHTING PROVISIONS

- B. L70 of 50,000 or greater with minimum 5 year warranty to support lifetime claim
- C. Passive cooling only for LED fixtures with less than 2000 lumens
- D. Color Temperature within 4 SDCM or less (Standard Deviation Color Matching aka MacAdam Ellipse)
- E. Remote Phosphor LEDs only where consistency of color over the life of the LED is critical
- F. Driver lifetime of 50,000 hours or more, with minimum 5 year warranty to support lifetime claim
- G. All light engines and drivers must be field-replaceable
- H. Driver information must be available including brand, dimming options, and amperage rating

2.3 CONTROLS

- A. Time switches shall be Tork, Intermatic, or Paragon of types and quantity shown on Drawings.

2.4 EMERGENCY EGRESS LIGHTING UNITS AND EXIT SIGNS

- A. Provide fully automatic operation on power failure. Units shall have integral battery back-up for 1½ hours per NFPA. Units shall be connected unswitched to lighting circuits.

PART 3 - EXECUTION

3.1 GENERAL

- A. Furnish, locate, and install fixtures as indicated on Drawings.

3.2 INSTALLATION

- A. Mount fixtures as called for in schedule on Drawings. Determine type of ceiling to be installed in each space and furnish fixtures suitable for exact type, including roof/floor or ceiling/floor fire rated design. Recessed fixtures shall be supported from building structure.
- B. Lighting fixtures shall be structurally supported. Fluorescent fixtures mounted in the ceiling shall be attached to ceiling system as required by NEC 410-16(b). Surface mounted fixtures shall be supported from building structural system by rods or rods and clamps, or by fixture outlet box which in turn shall be supported by rods.
- C. Receive, store, uncrate, and install light fixtures shown in schedule on drawings to be specified by others.

GENERAL LIGHTING PROVISIONS

- D. Adjust lighting fixtures to illuminate the intended area.
- E. Wire recessed fluorescent luminaries with Type THHN wire not smaller than No. 12.
- F. Wire surface mounted fluorescent luminaries with Type THHN wire not smaller than No. 12 from outlet boxes.
- G. Locate no splice or tap within an arm or stem. Wire shall be continuous from splice in outlet box of building wiring system to lamp socket or ballast terminals.

END OF SECTION 266100

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Protection, modification, or installation of utilities as site work progresses with particular attention to grade changes and necessary staging or phasing of work.
- B. Cutting, filling, and grading to required lines, dimensions, contours, and elevations for proposed improvements.
- C. Scarifying, compacting, drying, dewatering and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.2 RELATED SECTIONS

- A. Section 312300 – Excavation, Backfill, and Compaction for Structures.
- B. Section 312313 – Excavation, Backfill, and Compaction for Pavement.
- C. Section 321123 – Aggregate Materials
- D. Section 312513 – Slope Protection and Erosion Control
- E. The “Foundation Subsurface Preparation” as shown on the Construction Drawings and/or the Architectural-Structural drawings and/or the “Report of Subsurface Exploration”, whichever is more stringent if a conflict exists.
- F. Construction Drawings and Report of Subsurface Exploration.

1.3 REFERENCE STANDARDS

- A. American Society for testing and Materials (ASTM) latest edition.
 - 1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft²) (600 kN.m/m²).
 - 2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
 - 3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft²) (2,700 Kn.m/m²).
 - 4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
 - 5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - 6. D 2487 Classification of Soils for Engineering Purposes.
 - 7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
 - 8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.
 - 1. T 88 Particle Size Analysis of Soils.

1.4 QUALITY ASSURANCE

- A. An independent testing laboratory, selected and paid for by Contractor, shall be retained to perform construction testing on site.
 - 1. The independent testing laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, Civil Engineering Consultant, and Contractor shall be provided with copies of reports within 96 hours of time that test was performed. In event that test performed fails to meet Specifications, Owner and Contractor shall be notified immediately by the independent testing laboratory.
 - 2. Costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to Owner. Contractor shall provide free access to site for testing activities.

1.5 SUBMITTALS

- A. Submit 100-pound sample of each type of off-site fill material that is to be used at the site in air tight container(s) for the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.
- B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Engineer
- C. If fabrics or geogrids are to be used, design shall be submitted for approval to Engineer
- D. Submit Dewatering Plans upon request by Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Excavated and re-used material for subsoil fill as specified herein.
- B. Aggregate fill as specified in Section 321100.
- C. Imported fill material approved by Geotechnical Engineer and specified herein.

2.2 EQUIPMENT

- A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.3 SOURCE QUALITY CONTROL

- A. In areas to receive pavement, California Bearing Ratio (CBR) or Limerock Bearing Ratio (LBR) test shall be performed for each type of material that is imported from off-site.
- B. Following tests shall be performed as part of construction testing requirements on each type of on-site or imported soil material used as compacted fill:
 - 1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557).
 - 2. Mechanical Analysis: AASHTO T 88.
 - 3. Plasticity Index: ASTM D 4318.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Locate and identify existing utilities that are to remain and protect from damage.
- C. Notify utility companies to remove or relocate utilities that are in conflict with proposed improvements.
- D. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.
- F. Remove from site, material encountered in grading operations that, in opinion of the Geotechnical Engineer, is unsuitable or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in a legal manner. Backfill areas with layers of suitable material and compact as specified herein.
- G. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
 - 1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
 - 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.
 - 3. If proposed for fill, muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by Geotechnical Engineer. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 10'-0" of perimeter of building subgrade, retaining wall subgrade or paving subgrade. If, after observation by Geotechnical Engineer, material is found to be unsuitable, unsuitable material shall be removed from site.

H. Dewatering:

1. General:

- a. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom and/or sides. Design system to prevent differential hydrostatic head which would result in floating out soil particles in a manner termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps and/or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.
- b. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition.
- c. Control, by acceptable means, all water regardless of source and be fully responsible for disposal of the water.
- d. Confine discharge piping and/or ditches to available easement or to additional easement obtained by Contractor. Provide necessary permits and/or additional easement at no additional cost to Owner.
- e. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary to these purposes, lower water level in advance of excavation, utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.
- f. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
- g. Open pumping with sumps and ditches shall be allowed, provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
- h. Install wells and/or wellpoints, if required, with suitable screens and filters, so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping, and upon development of well(s), levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
- i. Control grading around excavations to prevent surface water from flowing into excavation areas.
- j. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

2. Design:

- a. Contractor shall designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
- b. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
- c. Contractor shall be solely responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

3. Damages:

- a. Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, or other contractor’s equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation, including, damage to the bottom due to heave

- and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.
- b. Remove subgrade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Owner.
4. Maintaining Excavation in Dewatering Condition:
 - a. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.
 - b. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction and/or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
 - c. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
 - d. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.
 5. System Removal:
 - a. Remove dewatering equipment from the site, including related temporary electrical service.
 - b. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.2 EXCAVATION FOR FILLING AND GRADING

- A. Classification of Excavation: Contractor acknowledges that site has been investigated to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered classified.
- B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.
- C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.
- D. Excavated material containing rock or stone greater than 6-inches in largest dimension is unacceptable as fill within proposed building subgrade and paving subgrade.
- E. Rock or stone less than 6-inches in largest dimension is acceptable as fill to within 24-inches of surface of proposed subgrade when mixed with suitable material.
- F. Rock or stone less than 2-inches in largest dimension and mixed with suitable material is acceptable as fill within the upper 24-inches of proposed subgrade.

- G. If excavated on-site materials exhibit visual, olfactory, or other similar sensory evidence of environmental impact (i.e. staining, odor, unusual debris, etc.), discontinue excavation in the area and notify the Engineer.

3.3 FILLING AND SUBGRADE PREPARATION

- A. Fill areas to contours and elevations shown on Construction Drawings with unfrozen materials.
- B. Place fill in continuous lifts specified in Geotechnical Report.
- C. Refer to Section 312300 and Geotechnical Report for filling requirements for structures.
- D. Refer to Section 312313 and Geotechnical Report for filling requirements for pavements.
- E. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8-inches and compacted as per the geotechnical report included herein.
- F. Fill materials used in preparation of subgrade shall be placed as per the geotechnical report included herein.
- G. Material imported from off-site shall have CBR value equal to or above pavement design subgrade CBR value indicated in the geotechnical report.

3.4 MAINTENANCE OF SUBGRADE

- A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.
- C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.5 BORROW AND SPOIL SITES

- A. Contractor shall be responsible for compliance with NPDES and local erosion control permitting requirements for any and all off-site, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of property owner, Owner, and Civil Engineering Consultant.

3.6 RIP-RAP

- A. This work shall consist of furnishing and setting or placing rubble stone, crushed stone, concrete blocks, sacked sand-cement or machined rip-rap. Slope pavement shall consist of the construction of a reinforced concrete mat on prepared slopes. Construction shall be in reasonable close

conformity to the lines, grades, dimensions, typical details and sizes shown on the drawings or as directed by the Engineer.

- B. All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:
- C. Rip-rap and slope pavement shall conform to Subsection 709 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 1981 or latest revisions.

3.7 FINISH GRADING

- A. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10-feet above or below established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential.
- B. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities. Refer to Section 312513 for slope protection and erosion control.

3.8 FIELD QUALITY CONTROL

- A. Field density tests for in-place materials shall be performed as part of construction testing requirements according to one of the following standards:
 - 1. Sand-Cone Method: ASTM D 1556.
 - 2. Balloon Method: ASTM D 2167.
 - 3. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission).
- B. Perform density test as follows:
 - 1. Building Subgrade Areas, Including 10'-0" Outside of Exterior Building Lines: In cut areas, not less than 1 compaction test for every 2,500 sq. ft. In fill areas, same rate of testing for each 6-inch lift, measured loose.
 - 2. Areas of Construction Exclusive of Building Subgrade Areas: In cut areas, not less than 1 compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 6-inch lift, measured loose.
- C. Corrective measures for non-complying compaction:
 - 1. Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

END OF SECTION 310000

SECTION 311000 - SITE CLEARING

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. Protecting existing trees and vegetation to remain.
 - 2. Removing trees and other vegetation.
 - 3. Clearing and grubbing.
 - 4. Topsoil stripping.
 - 5. Removing above-grade site improvements.

- B. Related Sections include the following:
 - 1. Section 01 50 00 - "Facilities and Controls".

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become the Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

- A. Record drawings according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without

permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 3. Maintain designated site access for vehicular and pedestrian traffic.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the Owner's premises where indicated.
- C. Notify the utility locator service for the area where the Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place and all appropriate inspections and certifications by the Engineer and City of Knoxville have been completed.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 02300 Section "Earth Work."
1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available onsite.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation, utilities, and features designated to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.3 UTILITIES

- A. All public utilities to be located and marked. All utilities to be abandoned or removed shall be conducted in a manner that complies with the demolition drawing sheets, details, and notes.
- B. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's Representative's written permission.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation, unless noted otherwise on Drawings. Removal includes digging out stumps and obstructions and grubbing roots.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct work.
 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Burning of debris on site shall not be permitted.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Do not stockpile topsoil within drip line of remaining trees.
 - 2. Dispose of excess topsoil as specified for waste material disposal.
 - 3. Stockpile surplus topsoil and allow for re-spreading deeper topsoil.

3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 312113 – RADON MITIGATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes: Piping and exhaust for radon mitigation.
- B. Related Sections include:
 - 1. Division 07 Sections for Joint Sealants and Penetration Firestopping
 - 2. Division 22 Sections for Piping and Venting
 - 3. Division 26 Sections for Electrical power and circuits to radon system fans
 - 4. Division 31 Sections for Earthwork and Excavations
 - 5. Division 33 Sections for Utilities

1.3 DEFINITIONS

- A. Radon: A naturally-occurring radioactive gas produced in rocks and soils.
- B. PCi/L: Picocuries per Liter, the unit of measurement for the concentration of radon in air.
- C. Soil Gas: The natural mixture of gasses present in soils that may or may not contain radon.
- D. ASD: Active Soil Depressurization

1.4 REFERENCES

- A. NRPP: National Radon Proficiency Program
- B. NRSB: National Radon Safety Board
- C. Certification credentials upon completion of specific training programs:
 - 1. RMP: Radon Measurement Professional
 - 2. RMS: Radon Mitigation Specialist
 - 3. RMT: Radon Mitigation Technician
 - 4. RMFT: Radon Measurement Field Technician
 - 5. RMI: Radon Mitigation Installer
 - 6. ARL: Accredited Radon Laboratory

- D. ANSI/AARST Consortium on National Radon Standards:
 - 1. RMS-MF: Radon Mitigation Standards for Multifamily Buildings
 - 2. RMS-LB: Radon Mitigation Standards for Schools and Large Buildings
 - 3. CC-1000: Soil Gas Control Systems in New Construction of Buildings

1.5 EXISTING RADON MEASUREMENTS

- A. The Contractor shall request from the Owner any radon measurement reports for the building structure areas to be mitigated.
 - 1. Advise the Owner in writing when re-testing, or additional testing, is necessary to determine the appropriate design of the radon mitigation system.

1.6 SUBMITTALS

- A. Product Data: For radon mitigation system piping and fittings.
- B. Shop Drawings: For radon mitigation system piping.
- C. Delegated-Design Submittal: Radon mitigation systems design narrative and drawings signed and sealed by the qualified professional engineer responsible for their preparation, including:
 - 1. The Qualified Mitigation Professional's contact information and certification numbers
 - 2. A description of the proposed mitigation system
 - 3. A description of the long-term operation, maintenance, and monitoring plan (OM&M) applicable to the proposed mitigation system design.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Certified by the NRPP or NRSB to design and install radon mitigation systems, responsible for the implementation, execution, and documentation of quality and safety procedures.

PART 2 - PRODUCTS

2.1 RADON MITIGATION SYSTEM PIPING

- A. Radon mitigation systems shall be designed and installed as permanent, integral components within the building, and shall be a stand-alone system not connected to other systems.
- B. Piping Materials:
 - 1. ABS plastic piping shall comply with ASTM D2661, F628 or F1488. Pipe wall thickness shall be Schedule 40 with solid, cellular core or composite wall. ABS pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions, with solvent cement conforming to ASTM D 2235.

2. PVC plastic piping shall comply with ASTM D2665, F891 or F1488. Pipe wall thickness shall be Schedule 40 with solid, cellular core or composite wall. PVC pipe joints shall be joined in accordance with the pipe manufacturer's instructions with cement conforming to ASTM D2564.
- C. Locate radon mitigation system piping and components so as not to interfere with operations and functions of other building systems. Keep visibility of the systems to a minimum, and out of occupied spaces except for mechanical and electrical rooms, storerooms, janitor closets, crawl spaces, and attic spaces.
- D. System Outlet Location: Mitigation system discharge points shall be as specified in ANSI/AARST Standards. Prevent foreign objects from entering the outlet. Maintain watertight seals through all penetrations to the building exterior. Points of discharge shall meet the following requirements:
 1. Outlets must discharge above the roof.
 2. Outlets must be 10 feet or more above the ground.
 3. Outlets must be 10 feet or more away from any window, door, or other opening into conditioned spaces.
- E. Where installation of a radon mitigation system requires pipe or ducts to penetrate a firewall or other fire resistance rated partition, penetrations shall be protected in accordance with applicable building, mechanical, fire, and electrical codes.
- F. Radon vent pipe runs subjected to cold environments should be insulated to prevent vent pipe freezing. Radon vent pipes in attics or where warm, moist environments exist should also be insulated to reduce condensation on pipe surfaces.
- G. To prevent blockage of air flow into the bottom of radon vent pipes, these pipes shall be supported or secured in a permanent manner that prevents their downward movement into suction pits or sump pits, or into the soil beneath an aggregate layer under a slab.
- H. Radon vent pipes shall be installed in a configuration that ensures that any rain water or condensation on or within the pipes drains downward to the ground beneath the slab soil-gas barrier membrane.

2.2 EXHAUST FANS

- A. Fans installed at piping exhaust points shall be for outdoor exposure and listed by the manufacturer for radon mitigation as one of the fan's intended possible uses.
 1. Fans shall include rain caps and wire mesh to prevent blockage from rain and wind-driven debris or intrusion from animals and insects, without decreasing intended airflow.
 2. Exterior fans must be hardwired into an electrical circuit, and an electrical disconnect switch must be installed within sight of the fan to permit deactivation of the fan for maintenance or repair.
- B. All mitigation systems that incorporate exhaust fans shall include a monitoring mechanism to indicate whether the fan, blower, or other integral mechanical components are operating within

the intended range. The monitor shall provide immediate notification to the party responsible for the system maintenance of any fan or mechanical failure.

PART 3 - EXECUTION

3.1 RADON MITIGATION SYSTEM PIPING INSTALLATION

- A. Plan and lay work out in advance. Exercise care where cutting, channeling, chasing or drilling floors, walls, partitions, ceilings or other surfaces as necessary for proper installation, support or anchorage.
- B. Label components of the radon mitigation system, including piping, fans, conduit, and circuit breakers, to clearly differentiate the radon-system components from other similar-looking system components. Labels shall read "Radon Reduction System", in permanent stenciled paint, or snap-on plastic pipe markers, in a color contrasting to the background.
- C. Piping must be adequately secured to the building structure, not supported by or attached to other piping, ductwork, or equipment. Horizontal pipe must be supported every 6 feet, and vertical pipe must be supported every 8 feet.

3.2 POST-INSTALLATION FUNCTIONAL EVALUATION

- A. The Contractor shall measure the airflow in system piping and record results along with at least one pressure field extension (PFE) measurement that is conducted under closed-building and normal operating conditions.
- B. To provide an initial measure of system effectiveness, the installer shall conduct one short-term radon measurement no sooner than 24 hours after a mitigation system is operational and within 30 days after installation of the system. Provide results report to the Owner.

END OF SECTION 312113

SECTION 313116 – TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Pre-construction liquid soil termiticide treatment.
- B. Related Sections include:
 - 1. Division 06 Sections for Rough Carpentry, Sheathing, and other wood products.
 - 2. Division 07 Sections for flashing and exterior envelope products.

1.3 SUBMITTALS

- A. Product Data: For each type of termite control product, including cut sheets, MSDS sheets, and manufacturer's instructions for application.
 - 1. Include the EPA-Registered Label for termiticide products.
- B. Qualification Data for Installer: For company and application personnel to demonstrate experience, training, and certifications.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.
- D. Wood Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Termiticide brand name and manufacturer.
 - 3. Quantity of undiluted termiticide used.
 - 4. Dilutions, methods, volumes used, and rates of application.
 - 5. Areas of application.

- E. Warranties: Sample of special warranty forms.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver termiticide material to the site in the original unopened containers bearing legible labels indicating the EPA registration number, manufacturer's registered uses and in new or otherwise good condition as supplied by the manufacturer or formulator.
- B. Inspect termiticides upon arrival at the job site for conformity to type and quality. Each label must bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), or as required by the local authorities. Inspect other materials for conformance with specified requirements. Remove unacceptable materials from the job site.
- C. Handle and mix termiticides in accordance with the manufacturer's label and SDS, preventing contamination by dirt, water, and organic material. Protect termiticides from weather elements as recommended by the manufacturer's label and SDS. Spill kits must be maintained on pest control vehicles and must be available at the mixing site. Conduct termiticide mixing in an area with adequate spill containment.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
- B. Coordinate soil treatment application with excavating, filling, grading, and concrete operations. Treat soil under footings, foundation walls, and slabs-on-grade before construction.
- C. Apply wood treatment after framing, sheathing, and exterior weather protection is completed but before electrical and mechanical systems are installed.
- D. Do not permit chemicals to enter stormwater runoff or collection systems, aquifers, or other water sources that may endanger humans and animals.

1.7 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

- B. Wood Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied wood termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite damage is discovered during warranty period, repair or replace damage caused by termite infestation and treat replacement wood.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide non-repellent formulas to kill termites without repelling them to other areas.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Termidor, by BASF
 - b. DemonMax, by Syngenta Crop Protection, LLC
 - c. Dominion, by Control Solutions Inc.
 - d. Or an approved equal.

- B. Select a termiticide that is suitable for the soil and climatic conditions at the project site and apply at the highest labeled rate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

- B. Eliminate food sources by removing debris from clearing and grubbing and post construction wood scraps such as ground stakes, form boards, and scrap lumber from the site, before termiticide application begins.

3.2 APPLICATION

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
- B. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
- C. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
- D. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
- E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- F. Post warning signs in areas of application.
- G. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.
 - 1. The exterior foundation perimeter treatment will have to occur in phases when any pads, porches, aprons, sidewalks, final grading or landscape planting are subsequently installed adjacent to the building foundation.
- H. Rodding and Trenching: For establishing vertical soil barriers. Trenching must be to the depth of the foundation footing. Width of trench must be as recommended by the manufacturer, or as indicated. Rodding or other approved method may be implemented for saturating the base of the trench with termiticide. Backfill the trench immediately after termiticide has reached maximum penetration as recommended by the manufacturer.

END OF SECTION 313116

SECTION 321100-PAVING BASE COARSE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Construction of granular base for asphaltic concrete and Portland cement concrete paving.
- B. Construction of sand/shell base for asphaltic concrete and Portland cement concrete paving.
- C. Construction of full depth asphalt base for asphaltic concrete paving.
- D. Construction hot-mix sand asphalt base for asphaltic concrete paving.
- E. Construction of soil cement stabilized base for asphaltic concrete and Portland cement concrete paving.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- ~~B. Section 312313 – Excavation, Backfill, and Compaction for Pavement~~
- C. Section 321123 – Aggregate Materials
- D. Section 321600 – Curbs and Sidewalks
- E. State Highway Department Standard Specifications
- F. Construction Drawings

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) latest edition.
 - 1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft²) (600 kN.m/m²)
 - 2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
 - 3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft²) (2,700 kN.m/m²)
 - 4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
 - 5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.

6. D 2487 Classification of Soils for Engineering Purposes.
 7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
 8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
 9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. American Association of State Highway and Transportation Official (AASHTO) latest edition.
1. T88 Particle Size Analysis of Soils
- 1.4 QUALITY ASSURANCE
- A. An independent testing laboratory selected and paid by Contractor, will be retained to perform construction testing of in-place base course for compliance with requirements for thickness, compaction, density, and tolerances. Paving base course tolerances shall be verified by rod and level readings on not more than 50-foot centers to be not more than 0.05 feet above design elevation which will allow for paving thickness as shown on Construction Drawings. Contractor shall provide instruments and suitable benchmark. Contractor shall also ensure that all inspections and testing required by the City of Knoxville are completed.

PART 2 – PRODUCTS

2.1 FILL MATERIALS

- A. Submit materials certificate to the independent testing laboratory which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

2.2 SOURCE QUALITY CONTROL

- A. Following test will be performed on each type of material used as base course material:
1. Moisture and Density Relationship: ASTM D 698 (or ASTM D 1557).
 2. Mechanical Analysis: AASHTO T 88.
 3. Plasticity Index: ASTM D 4318.
 4. Base material thickness: Perform 1 test for each 20,000 sq. ft. of in-place base material area.
 5. Base material compaction: Perform 1 test in each lift for each 20,000 sq. ft. of in-place base material area.

6. Test each source of base material for compliance with state highway department specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with the requirements of applicable state highway department specifications section(s) referred to or noted on the Construction Drawings.

3.2 CONSTRUCTION

- A. Construction shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to aggregate base course design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

3.3 FIELD QUALITY CONTROL

- A. Field density tests for in-place materials shall be performed in accordance with one of following standards:
 1. Sand-Cone Method: ASTM D 1556.
 2. Balloon Method: ASTM D 2167.
 3. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission).
- B. The independent testing laboratory will prepare reports that indicate test location, elevation data, and test results. Owner and Contractor shall be provided with copies of the reports within 96 hours of the time the test was performed. In the event that the test results show failure to meet any of the Specifications; Owner and Contractor will be notified immediately by the independent testing laboratory.
- C. Costs related to retesting due to failures shall be paid for by Contractor at no additional expense to Owner. Contractor shall provide free access to the site for testing activities.

END OF SECTION 321100

SECTION 321123-AGGREGATE MATERIALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Aggregate materials for use as specified in other sections.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- ~~B. Section 312300 – Excavation, Backfill, and Compaction for Structures~~
- ~~C. Section 312313 – Excavation, Backfill, and Compaction for Pavement~~
- D. Section 312513 – Slope Protection and Erosion Control
- E. Construction Drawings and Report of Subsurface Exploration

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition.
 - 1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft²)(600 kN.m/m²)
 - 2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
 - 3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft-lbf/ft²) (2,700 kN.m/m²)
 - 4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
 - 5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - 6. D 2487 Classification of Soils for Engineering Purposes.
 - 7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
 - 8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
 - 9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.

1. TT 88 Particle Size Analysis of Soils

1.4 QUALITY ASSURANCE

- A. Tests and analysis of aggregate materials will be performed in accordance with ASTM and AASHTO procedures specified herein.

1.5 SUBMITTALS

- A. Submit 100-pound sample of each aggregate or mixture that is to be incorporated into project in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be incorporated into project to the Engineer for review.
- B. Submit name of each material supplier and specific type and source of each material. Any change in source requires approval of Engineer.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Construction and materials shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to paving base course design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

2.2 EQUIPMENT

- A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger any improvements by rutting, overloading, or pumping.

PART 3 – EXECUTION

3.1 STOCKPILING

- A. Stockpile on-site at locations indicated by Owner in such manner that there will be no standing water or mixing with other materials.

3.2 BORROW AND SPOIL SITES

- A. Upon completion of borrow and/or soil operations, clean up borrow and/or soil areas as indicated on Construction Drawings in neat and reasonable manner to satisfaction of property owner and Owner.

END OF SECTION 321123

SECTION 321216-ASPHALT CONCRETE PAVING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of Asphalt concrete paving work is shown on the drawings.
- B. Clearing, earthwork and prepared aggregate subbase is specified in earthwork sections.

1.3 SUBMITTALS

- A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with “Standard Specifications for Road and Bridge Construction” by the Tennessee Department of Transportation, latest edition, and with local governing regulations if more stringent than herein specified.

1.5 JOB CONDITIONS

- A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 degrees F. (10 degrees C.), and when temperature has not been below 35 degrees F. (1 degree C.) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- B. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F. (4 degrees C.) and when base is dry. Base course may be placed when air temperature is above 30 degrees F. (-1 degree C.) and rising.
- C. Grade Control: Establish and maintain required grades and elevations.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Use locally available materials and gradations, which exhibit a satisfactory record of previous installations.
- B. Materials shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which

pertain to paving design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.
- B. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.
- C. Notify General Contractor of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.
- D. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.
- E. Prime Coat: Apply as indicated on Construction Drawings, over compacted subgrade. Apply material to penetrate and seal, but not flood surface. Cure and dry as long as necessary to obtain penetration and evaporation of volatile gases.
- F. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at a rate indicated on Construction Drawings. Allow to dry until at proper condition to receive paving.
- G. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.2 PLACING MIX

- A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F. (107 degrees C.). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.
- B. Paving Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
- C. Joints: Make joints between old and new pavement, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean compact surfaces and apply tack coat.

3.3 ROLLING

- A. General: Begin rolling when mixture will bear roller weight without excessive displacement.
- B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced area by loosening and filling, if required, with hot material.
- D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
- E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
- F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 TRAFFIC AND LANE MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Striping Use chlorinated rubber base traffic lane-marking paint, factory-mixed, quick drying, and non-bleeding. Color: White
- C. Do not apply traffic and lane-marking paint until layout and placement has been verified by the Owner or Owner's Representative.
- D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.5 FIELD QUALITY CONTROL

- A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.
- B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

Base course: $\frac{1}{2}$ ", plus or minus
Surface course: $\frac{1}{4}$ ", plus or minus.

- C. Surface smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at the right angles to center line of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.
- Base Course Surface: $\frac{1}{4}$ "
 - Wearing Course Surface: $\frac{3}{16}$ "
- Crowned Surfaces: Test with crowned template centered and at right angle to crown.
Maximum allowable variance from template: $\frac{1}{4}$ ".
- D. Check surface areas at intervals as directed by Engineer.

END OF SECTION 321216

SECTION 321600-CURBS AND SIDEWALKS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and placement of combination Portland cement concrete curb and gutter.
- B. Preparation and placement of Portland cement concrete curb.
- C. Preparation and placement of Portland cement concrete sidewalk.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- B. Section 321123 – Aggregate Material.
- C. Cast-in-place Concrete (See Architectural/Building Specifications).
- D. State Highway Department Standard Specifications.
- E. Construction Drawings.

1.3 REFERENCE STANDARDS

- A. American Concrete Institute (ACI) latest edition.
 - 1. 304R Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - 2. 308 Standard Practice for Curing Concrete.
- B. American Society for Testing and Materials (ASTM) latest edition.
 - 1. A615 Deformed and Plain Billet-Steel for Concrete Reinforcement.
 - 2. C33 Concrete Aggregates.
 - 3. C94 Ready-Mixed Concrete.
 - 4. C150 Portland Cement.
 - 5. C260 Air-Entraining Admixtures for Concrete.
 - 6. C309 Liquid Membrane-Forming Compounds for Curing Concrete.
 - 7. C494 Chemical Admixtures for Concrete.

8. D1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Types)

C. FS TT-C-800 – Curing Compound, Concrete, for New and Existing Surfaces.

1.4 QUALITY ASSURANCE

A. Establish and maintain required lines and elevations.

B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

1.5 SUBMITTALS

A. Submit materials certificate to the independent testing laboratory which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

1.6 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.

C. Concrete Materials: Comply with requirements of Section 033000 for concrete materials, admixtures, bonding materials, curing materials, and others as required.

D. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type II, Class A.

E. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn “Sonolastic Paving Joint Sealant, Sonneborn “Sonomeric CT 1 Sealant”, Sonneborn “Sonomeric CT 2 Sealant, Mameco “Vulken 245”, or Woodmont Products “Chem-Caulk”.

2.2 MIX DESIGN AND TESTING

- A. Concrete mix design and testing shall comply with requirements of Section 03300.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
 - 1. Compressive Strength: 4,000 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.
 - 2. Slump Range: 2 to 5 inches at time of placement.
 - 3. Air Entrainment: 5 to 8 percent.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Proofroll prepared base material surface to check for unstable areas. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

- A. Form Construction:
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
 - 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8-inch in 10'-0".
 - b. Vertical face of longitudinal axis, not more than 1/4-inch in 10'-0".
 - 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.
- B. Concrete Placement:
 - 1. Place concrete in accordance with requirements of Section 033000.
 - 2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.

3. Place Concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowel, and joint devices.
 4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible, if interrupted for more than ½ hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.
- C. Joint Construction:
1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with ¾-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.
 2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, to concrete pavement with ½-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
 3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.
- D. Joint Filler: Extend joint fillers full-width and depth of joint, and not less than ½-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.
- E. Joints Sealants: Seal joints with approved exterior pavement joint sealants. Install in accordance with manufacturer's recommendations.
- 3.3 INSTALLATION PROCEDURES
- A. The area to receive imprinted concrete shall have the sup-grade prepared as required as for any concrete slab on grade.
 - B. The formwork shall be installed in accordance with the drawings. The slab thickness shall be consistent with that of ordinary concrete slabs under the same conditions.
 - C. Provide reinforcement as specified.

- D. Control joints and/or expansion joints shall be provided in accordance with the drawings and the guidelines established by the American Concrete Institute. As with any concrete slab, imprinted concrete usually contains construction joints, control joints and expansion joints. The contractor shall advise and work with the architect/engineer to determine the best location for these joints to minimize the visibility of the joints and to minimize unsightly cracking.
- E. The concrete shall be placed and screeded to finished grade, and floated to a uniform surface using standard finishing techniques.
- F. While the concrete is still in its plastic stage of set, the imprinting tools shall be applied to the surface.
- G. Cure and Seal, or approved equal shall be applied in accordance with the manufacturer's recommendations immediately after the completing the imprinting process for
- H. After the initial curing period the surface of the slab shall be sealed.

3.4 BACKFILL

- A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with geotechnical report.

3.5 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 321600

SECTION 321723-PAVEMENT MARKINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and application of painted pavement markings.
- B. Preparation and application of paint on curbs, guard posts, and light pole bases.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork.
- B. Section 321100 – Paving Base Course.
- C. Section 321600 – Curbs and Sidewalks.
- D. Construction Drawings.

1.3 REFERENCE STANDARDS

- A. FS TTP-85E

1.4 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Paint shall be non-bleeding, quick-drying, alkyd petroleum base paint suitable for traffic-bearing surface and shall meet FS TTP-85E and be mixed in accordance with manufacturer's instructions before application.
- B. Performed pavement markings shall be Stamark Intersection Grade Tape Series A420 as manufactured by 3M Traffic Control Materials Division, or approved equal.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Sweep and Clean surface to eliminate loose material and dust.
- B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive device shall be used to remove

the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of way, method of marking removal shall be approved by appropriate governing authority.

3.2 APPLICATION

- A. Apply two coats of paint at manufacturer's recommended rate, without addition of thinner, with maximum 100 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.
- B. Install pavement markings according to manufacturer's recommended procedures for the specified material.
- C. Following items shall be painted with colors noted below:
 - 1. Pedestrian Crosswalks: White
 - 1. Exterior Sidewalk Curbs, Light Pole Bases, and Guard posts: as selected by Owner.
 - 2. Fire Lanes: Red or per local code.
 - 3. Lane Striping where separating traffic moving in opposite directions: Yellow
 - 4. Lane Striping where separating traffic moving in the same direction: White
 - 5. Handicap Symbols: Blue or per local code
 - 6. Parking Stall Striping: White, unless otherwise noted on Construction Drawings
 - 7. Associate Parking Area: White, unless otherwise noted on Construction Drawings

END OF SECTION 321723

SECTION 331100 - WATER DISTRIBUTION

PART 1 - GENERAL

LOCAL UTILITY SPECIFICATIONS

- A. The Contractor shall contact the local authorities to determine if Standard Specifications for Water Distribution are available from the Local Utility District. If Local Utility District specifications are available, the Contractor shall utilize them in lieu of the following specification.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. This Section includes water-distribution piping and specialties outside the building for the following:
 - 1. Water services.
 - 2. Fire-service mains.
 - 3. Combined water service and fire-service mains.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.4 DEFINITIONS

- A. Combined Water Service and Fire-Service Main: Exterior water piping for both domestic-water and fire-suppression piping.
- B. Fire-Service Main: Exterior fire-suppression-water piping.
- C. Water Service: Exterior domestic-water piping.
- D. The following are industry abbreviations for plastic materials:
 - 1. PVC: Polyvinyl chloride plastic.

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Piping specialties.
2. Valves and accessories.
3. Water meters and accessories when not provided by the utility company.
4. Fire hydrants.

1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Regulatory Requirements:
 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
 - 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- C. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 PVC PIPE AND FITTINGS

- A. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket and spigot end.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

- a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 JOINING MATERIALS

- A. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.
- B. Transition Couplings:
 1. Underground Piping, NPS 1-1/2 and Smaller: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
 2. Underground Piping, NPS 2 and Larger: AWWA C219, metal, sleeve-type coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Brazing Filler Metals: AWS A5.8, BCuP Series.
- D. Soldering Flux: ASTM B 813, water-flushable type.
- E. Solder Filler Metal: ASTM B 32, lead-free type with 0.20 percent maximum lead content.
- F. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- G. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.5 GATE VALVES

- A. AWWA, Cast-Iron Gate Valves:
 1. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - a. Minimum Working Pressure: 200 psig.
 - b. End Connections: Mechanical joint.
 - c. Interior Coating: Complying with AWWA C550.
- B. Bronze Gate Valves:
 1. OS&Y, Rising-Stem Gate Valves: UL 262, FM-approved bronze body and bonnet, outside screw and yoke, and bronze stem.
 - a. Minimum Working Pressure: 200 psig.
 - b. End Connections: Threaded.

2.6 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Tapping-Sleeve Assemblies: Comply with MSS SP-60. Include sleeve and valve compatible with drilling machine.
 - 1. Tapping Sleeve: Cast- or ductile-iron or stainless steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
 - 2. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5-inch- diameter barrel.
 - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.7 CHECK VALVES

- A. AWWA Check Valves:
 - 1. Check Valves: AWWA C508, swing-check type with 175-psig working-pressure rating and resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

2.8 CORPORATION VALVES AND CURB VALVES

- A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
 - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
- B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over curb valve, and approximately 3-inch- diameter barrel.
 - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.9 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
- B. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
- C. Manhole: ASTM A 48, Class No. 35 minimum tensile strength, gray-iron traffic frame and cover.
 - 1. Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.
- D. Drain: ASME A112.21.1M, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.10 FREESTANDING FIRE HYDRANTS

- A. Fire hydrant type shall be as required by utility company.
- B. Dry-Barrel Fire Hydrants: AWWA C502, one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure, and 150-psig minimum working-pressure design.
 - 1. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - 2. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - 3. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - 4. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- C. Do not use flanges, unions, or keyed couplings for underground piping.

- D. Flanges, unions, keyed couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground Water-Service Piping: Use the following piping materials for each size range:
 - 1. NPS 3/4 to NPS 3: Soft copper tube, Type K; wrought-copper fittings; and brazed joints.
 - 2. NPS 6 and NPS 8: AWWA C900 Class 200 PVC push-on-joint pipe; mechanical-joint, ductile-iron fittings; and gasketed joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
 - 2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FM, cast-iron, nonrising-stem gate valves with indicator post.

3.4 JOINT CONSTRUCTION

- A. See Division 2 Section "Utility Materials" for basic piping joint construction.
- B. Make pipe joints according to the following:
 - 1. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.
 - 2. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
 - 3. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 2 Section "Utility Materials" for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. See Division 2 Section "Utility Materials" for piping-system common requirements.

3.6 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Make connections NPS 2 and smaller with drilling machine according to the following:
 - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
 - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 - 4. Install corporation valves into service-saddle assemblies.
 - 5. Install curb valve in water-service piping with head pointing up and with service box.
- D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- E. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.
- F. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 36 inches cover over top.
- G. Install piping by tunneling, jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

3.7 ANCHORAGE INSTALLATION

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
- B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.10 VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.
- B. Connect drain outlet to storm drainage piping. Refer to Division 2 Section "Storm Drainage."

3.11 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.12 GROUND HYDRANTS AND PEDESTAL DRINKING FOUNTAIN INSTALLATION

- A. Install ground hydrants and pedestal drinking fountains per manufacturer's recommendations.

3.13 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.14 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See Division 2 Section "Earthwork" for underground warning tapes.

3.15 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - a. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as required by the local utility company.
- B. Prepare reports of purging and disinfecting activities.

END OF SECTION 331100

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

SECTION 331300 - DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Disinfection of potable water distribution and transmission system.
- B. Testing and reporting results.

1.2 RELATED SECTIONS

- A. Section 33 11 13 – Site Water Lines.
- B. Section 33 11 19 – Fire Water System.

1.3 MEASUREMENT AND PAYMENT

- A. Disinfection:
 - 1. Basis of Payment: no separate payment, included in the other items of work.

1.4 REFERENCES

- A. ANSI/AWWA B300 - Standard for Hypochlorites.
- B. ANSI/AWWA B301 - Standard for Liquid Chlorine.
- C. ANSI/AWWA B303 - Standard for Sodium Chlorite.
- D. ANSI/AWWA C651 - Standards for Disinfecting Water Mains.

1.5 SUBMITTALS

- A. Test Reports: Indicate results comparative to specified requirements.
- B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.6 PROJECT RECORD DOCUMENTS

- A. Provide the following:
- B. Disinfection report; record:
 - 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.

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5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological report; record:

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 used.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of the state.
8. Bacteriologist's signature and authority.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI/AWWA C651.

1.8 QUALIFICATIONS

- A. Testing Firm: Group specializing in examining potable water systems, approved by the State of Tennessee.

1.9 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: ANSI/AWWA B300, Hypochlorite, ANSI/AWWA B301, Liquid Chlorine, and ANSI/AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 EXECUTION

- A. Provide and attach required equipment to perform the work of this Section.

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- B. Inject treatment disinfectant 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.

3.2 QUALITY CONTROL

- A. Provide analysis and testing of treated water under provisions of Section 01400.
- B. Test samples in accordance with ANSI/AWWA C651.

END OF SECTION 331300

SECTION 333100 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 LOCAL UTILITY SPECIFICATIONS

- A. The Contractor shall contact the local authorities to determine if Standard Specifications for Sanitary Sewerage are available from the Local Utility District. If Local Utility District specifications are available, the Contractor shall utilize them in lieu of the following specification.

1.2 SUMMARY

- A. This Section includes gravity-flow, non-pressure and force-main, pressure sanitary sewerage outside the building, with the following components:
 - 1. Special fittings for expansion and deflection.
 - 2. Cleanouts.
 - 3. Precast concrete manholes.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Engineer no fewer than five days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

- A. PVC Gravity Sewer Pipe and Fittings: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.5 CLEANOUTS

- A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 MANHOLES

- A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 8. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
 9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
 10. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
 - a. Material: ASTM A 48/A 48M, Class 35 gray iron, unless otherwise indicated.
 - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 15-mil minimum thickness applied to all surfaces, unless otherwise indicated.

2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.

- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

- A. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials:
 - 1. PVC sewer pipe and fittings, gaskets, and gasketed joints conforming to ASTM D 3034 SDR 35.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.
- F. Install gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping below frost line.
 - 3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
- G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.4 PIPE JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 2 Section "Piped Utilities - Basic Materials and Methods." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 2 inches above finished surface elsewhere, unless otherwise indicated.

3.6 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use medium-duty, top-loading classification cleanouts in earth, unpaved foot-traffic and in paved foot-traffic areas.
 - 2. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.

- B. Set cleanout frames and covers in asphalt pavement and earth in cast-in-place-concrete block, 24 by 24 by 6 inches deep. Set with tops flush with pavement and 1 inch above surrounding grade when in earth.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.7 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping.
 - 2. Make branch connections into existing underground manholes by coring and installing a rubber boot as approved by the local utility provider.
 - 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.8 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

3.9 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 - f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
 - b. Option: Test concrete gravity sewer piping according to ASTM C 924.
 7. Manholes: Perform hydraulic test according to ASTM C 969.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

- A. Clean interior of piping of dirt and superfluous material. Flush with potable water.

END OF SECTION 333100

SECTION 334100-STORM SEWERS AND PIPE CULVERTS

PART 1- GENERAL

1.1 SECTION INCLUDES

- A. This work shall consist of the placing of precast concrete pipe, high density polyethylene (HDPE) corrugated pipe (with smooth waterway), and all fittings as called for on the drawings and in accordance with the Specifications including trench excavation, bedding, and backfill.
- B. Each pipe shall be clearly marked to show its class or gauge, date of manufacture, name of manufacturer, and mark of approval by an approved commercial testing laboratory prior to delivery.
- C. All pipe and special fitting shall be new materials, which have not been previously used and free of any defects or damage.
- D. Pipe sizes, class or gauge, and type of bituminous coating will be shown on the drawings. Size of the pipe is nominal inside diameter.
- E. All materials used in this construction, in addition to the general requirement of these Specifications, unless otherwise stipulated, shall conform to the following:
 - 1. Storm sewers and pipe culverts shall conform to Subsection 607 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 1981 or latest revisions.
 - 2. HDPE pipe shall conform to AASHTO M252, M294, MP7 and shall be either AASHTO Type "S" or AASHTO Section 30 or ASTM D2321 and any details shown on the drawings or as recommended by the manufacturer.

1.2 EXISTING UTILITIES

- A. All existing sewers, water lines, gas lines, underground conduits, telephone lines, electric lines or other utilities or structure in the vicinity of the work shall be carefully protected by the Contractor from damage at all times.

PART 2 – EXECUTION

2.1 TRENCHING AND BACKFILLING

- A. Protect all private roads and walks and maintain them during course of the work. Repair all damage at Contractor's expense.
- B. Erect construction fencing around all excavations before starting work.
- C. Provide and maintain guard lights at all barricades, railing, obstructions, in streets, roads, or sidewalks, and all trenches or adjacent to public walks or roads.

- D. Remove and replace at Contractor's expense all work damaged by failure to provide protection.
- E. Excavate trenches of sufficient width for proper installation of work. When depth of backfill over piping exceeds 10 feet, keep trench below level of top of pipe as narrow as practical.
- F. Perform trenching in accordance with OSHA and local safety regulations.
- G. Excavate all trenches to at least six inches below bottom elevation of pipe at all points. Grade trench bottom evenly. Lay piping in trenches on 6" bed of crushed stone with stone backfilled to 12" above top of pipe by hand.
- H. Trenches shall provide uniform bearing. Where rock is encountered, excavate 2' below the pipe and refill to pipe grade with gravel.
- I. Backfill trenches to grade only after piping has been inspected, tested, approved and location of pipe and appurtenances has been recorded. Tamp to 98% compaction. Under pavement, walks, and other surfacing, backfill shall be tamped solidly in layers not thicker than 6". Exclude all cinders and rubbish from trenches in which pipes are laid.
- J. If unstable soil conditions are encountered, erect adequate supports needed in an approved manner to adequately support the underground piping.

2.2 INSTALLATION

- A. The location of existing underground utilities are approximate locations only. Before beginning work determine the exact location of all existing utilities. The contractor shall pay for and repair all damages caused by failure to exactly locate and preserve any and all underground utilities. Connect to the public storm sewer system at a catch basin or other standard connection provided.
- B. Elevations shown on the drawings are to the invert of all gravity piping.
- C. Adjust inverts to keep tops of pipe inline where pipe size changes.
- D. Confirm elevation of existing storm drain connection point and grade storm drain at least 1/4" per foot unless otherwise indicated on drawings.
- E. All piping is shown diagrammatically on the drawing. Determine exact locations in the field. Coordinate exact locations with all trades before installation.
- F. Lay storm drainage piping to uniform grade. Make changes in directions of drain piping with long bends. No screwed joints are permitted in drainpipes, except as described herein.
- G. Provide and install cleanouts where shown on the drawings, at 100 foot intervals, and as required by local codes. Extend cleanouts through and terminate flush with the finished grade. Terminate with C.I. plugs.

2.3 FIELD QUALITY CONTROL

- A. Flush with water in sufficient volume to obtain free flow through each line. Remove all obstruction and correct all defects discovered. Remove all silt and trash from structures prior to final acceptance of work.

END OF SECTION 334100

SECTION 334900-STORM DRAINAGE STRUCTURES

PART 1- GENERAL

1.1 SECTION INCLUDES

- A. This work shall consist of constructing the following drainage structures: manholes, catch basins, inlets and junction boxes. Construction shall be in reasonably close conformity to the lines, grades, dimension and sizes shown on the drawings or as directed by the Engineer.
- B. The height or depth of these drainage structures will vary with location, but unless otherwise shown on the drawings, shall be such that the frames will match the line and grades of the parking area, roadway surface or grasses areas and the invert will be at the designated elevations.
- C. Cast iron frames, grates, and covers shall be provided as specified on the drawings.
- D. Manholes, inlets, catch basins, and junction boxes shall conform to the Standard Detail Drawings of the Tennessee Department of Transportation unless otherwise noted on the drawings. Deviations from these drawings may be approved, by submitting a detailed drawing to the Engineer before construction begins.
- E. All materials used in this construction, in addition to the general requirements of these Specifications, unless otherwise stipulated, shall conform to the following:
 - 1. Drainage structures shall conform to Subsection 611 of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction, 2015 or latest revisions.

END OF SECTION 334900