

VOLUME 1

Project Manual
Divisions 00 - 32

CHEROKEE ADDITION SINGLE FAMILY HOMES
Housing Authority of the
Cherokee Nation of Oklahoma
COLLINSVILLE, OKLAHOMA

Construction Drawings

February 3, 2023

ARCHITECT:



TRI-ARCH PLC
7420 South Yale Ave., Ste A
Tulsa, Oklahoma 74136

**SECTION 000101
TABLE OF CONTENTS**

**CHEROKEE ADDITION SINGLE FAMILY HOMES
HOUSING AUTHORITY OF THE CHEROKEE NATION OF OKLAHOMA
N. SHERIDAN ROAD at E. 136TH STREET NORTH
COLLINSVILLE, OKLAHOMA**

FEBRUARY 3, 2023

INTRODUCTORY INFORMATION

000001	Cover Page
000101	Table of Contents
000107	Seals Page – Architect

DIVISION 00 - BIDDING INFORMATION

002113	Instructions to Bidders
004113	Bid Form
004313	Bonds and Certificates
006000	Project Forms
007200	General Conditions
007300	Supplementary General Conditions
007301	Davis-Bacon Wage Rates

DIVISION 01 - GENERAL REQUIREMENTS

011000	Summary
012500	Substitution Procedures
012501	Substitution Request Form
012600	Contract Modification Procedures
013000	Administrative Requirements
013100	Project Management and Coordination
013300	Submittal Procedures
014000	Quality Requirements
014200	References
015000	Temporary Facilities and Controls
015700	Slope Protection and Erosion Control
016000	Product Requirements
017000	Execution and Closeout Requirements
017123	Field Engineering
017300	Execution
017419	Construction Waste Management

017823 Operation and Maintenance Data
017839 Project Record Documents
018913 Site Preparation

DIVISION 02 – EXISTING CONDITIONS (Not Used)

DIVISION 03 - CONCRETE

033000 Cast-in-Place Concrete

DIVISION 04 – MASONRY

042113 Brick Masonry Veneer
044113 Adhered Stone Masonry Veneer

DIVISION 05 – METALS (Not Used)

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000 Rough Carpentry
061063 Exterior Carpentry
061600 Sheathing
062023 Interior Woodwork.
064113 Wood-Veneer-Faced Architectural Cabinets

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072100 Insulation
072500 Weather Barriers
073113 Asphalt Shingles
074633 Plastic Siding
076200 Sheet Metal Flashing and Trim
079200 Joint Sealants

DIVISION 08 – OPENINGS

081416 Wood Doors
085313 Vinyl Windows
088000 Glazing
088300 Mirrors

DIVISION 09 - FINISHES

092900 Gypsum Board
093000 Tiling
096519 Resilient Tile Flooring
097700 Plastic Wall Panels
099113 Exterior Painting
099123 Interior Painting

DIVISION 10 - SPECIALTIES

102800 Toilet and Bath Accessories
104413 Fire Extinguishers

DIVISION 11 – EQUIPMENT

113100 Kitchen Appliances

DIVISION 12 – FURNISHINGS

123623 Plastic-Laminate-Clad Countertops

DIVISION 13 – SPECIAL CONSTRUCTION (Not Used)

DIVISION 14 – CONVEYING EQUIPMENT (Not Used)

DIVISIONS 15 – 20 (Not Used)

DIVISION 21 – FIRE SUPPRESSION (Not Used)

DIVISION 22 – PLUMBING

220000 Plumbing Specifications

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

230000 Heating, Ventilating and Air Conditioning Specifications

DIVISION 26 – ELECTRICAL

260000 Electrical Specifications

DIVISION 27 – COMMUNICATIONS (Not Used)

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY (Not Used)

DIVISION 31 – EARTHWORK

310010	Coordination and Meetings
310011	Submittals
310012	Quality Control
310013	Contract Closeout
310014	Material and Equipment
310020	Clearing and Restoration
310021	Demolition
310022	Trench Excavation and Backfill
310023	Structure Excavation and Backfill
310024	Seeding
310025	Embankment, Placing and Compacting
310026	Compaction Control and Testing
310027	Concrete
310028	Concrete Paving
310029	Asphalt Paving
310200	Water Pipe and Fittings
310201	Gate Valves
310205	Fire Hydrant
310206	Water Service Connection
310207	Hydrostatic Testing of Potable Lines
310208	Disinfection of Potable Lines
311200	Sanitary Sewer Lines and Appurtenances
314100	Testing Gravity Sewer Lines and Manholes

DIVISION 32 - EXTERIOR IMPROVEMENTS

324116	Termite Control
--------	-----------------

DIVISION 33 – UTILITIES (Not Used)

END OF DOCUMENT 000101

SECTION 000107
SEALS PAGE - ARCHITECT

PROJECT: **CHEROKEE ADDITION SINGLE FAMILY HOMES**
THE HOUSING AUTHORITY OF THE CHEROKEE NATION OF OKLAHOMA
Collinsville, Oklahoma

ARCHITECT OF RECORD

Scott Weston Vrooman AIA
TriArch, LLC
618 East Third Street
Tulsa, OK 74120
Registration No. 5378

Architect of Record

Date



**SECTION 002113
INSTRUCTIONS TO BIDDERS**

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Owner: The Housing Authority of the Cherokee Nation of Oklahoma, will receive bids for construction management of their project, the SINGLE-FAMILY HOME 3-BR and 4-BR ADA housing project, in Collinsville, Oklahoma.

1.2 DOCUMENTS FOR CONSTRUCTION

- A. Plans and Specifications are prepared by TriArch, 7320 South Yale Avenue, Suite A, Tulsa, Oklahoma 74136. Complete sets will be issued to each bidder.
- B. The Housing Authority of the Cherokee Nation of Oklahoma is soliciting bids for a General Contractor for a single-source bid to perform all work indicated in the Drawings and Specifications. Bids will be received in accordance with the terms and conditions stipulated and in full compliance with the plans and specifications prepared by TriArch and its professional consultants.

1.3 ADDITIONS, DELETIONS, OR MODIFICATIONS

- A. Additions, deletions, and/or modifications to the Contract Documents can only be issued by Addenda, prepared by TriArch and transmitted to the General Contractor prior to the bidding. No other interpretation, either electronic, oral or written, shall be considered compliant with the Construction Documents.

1.4 PRE-BID MEETING

- A. NON-MANDATORY PRE-BID MEETING will be held at the Housing Authority of the Cherokee Nation, 1500 Hensley Drive, Tahlequah, OK at **10:00 AM on June 30, 2023.**

1.5 BID QUESTIONS

- 1. Every request for interpretation of the meaning of the plans, specifications, or other pre-bid documents must be submitted in written format to Tony Popp. Request may be emailed to tpopp@tri-arch.com. No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally. To be given consideration, interpretation request must be received by later than **5:00 PM on July 17, 2023.**
- 2. Any an all such interpretations and any supplemental instruction will be in the form of written addenda to the specifications, which, if issued, will be posted with bid announcement on the Cherokee Nation Procurement website, www.cherokeebids.org

under HACN Procurements. Interpretations for this bid shall be posted by **July 21, 2023 by 5:00 PM.**

- 1.6 **BIDS DELIVERY:** Bids are due at the HACN, Administrative Conference Room, located at 1500 Hensley DR., Tahlequah, OK, on **July 31, 2023 at 9:55 A.M.** BID MUST BE RECEIVED ON OR BEFORE THE DEADLINE TO BE CONSIDERED. A public bid opening will immediately follow. Bids may be mailed and must be received before **July 28, 2023 by 5:00 PM.** The envelope containing the bid must be sealed and addressed to the Housing Authority of the Cherokee Nation, Attn: Whitney Cochran, P.O. Box 1007, Tahlequah, OK 74465. Bid may also be hand delivered to Whitney Cochran, at 5006 S. Muskogee Avenue, Tahlequah, OK by or before **July 28, 2023 at 5:00 PM.**

ENVELOPES TO BE MARKED:

SEALED BID ENCLOSED -- DO NOT OPEN

PROJECT: CHEROKEE ADDITION SINGLE FAMILY HOMES

1.7 BID OPENING

- A. A PUBLIC BID OPENING will be at **10:00 AM** at Housing Authority of the Cherokee Nation, 1500 Hensley Drive, Tahlequah, OK on **July 31, 2023.**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 002113

DOCUMENT 004113
BID FORM - STIPULATED SUM

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: **CHEROKEE ADDITION SINGLE FAMILY HOMES**
- C. Project Location: North Sheridan Road at East 136th St. North, Collinsville, Oklahoma.
- D. Owner: Housing Authority of the Cherokee Nation of Oklahoma, Tahlequah, Oklahoma

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Studio45 Architects and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of for each of the two following bid-breakouts:

BASE BID

- 1. _____ Dollars (\$_____).

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 TIME OF COMPLETION

- A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect and shall fully complete the Work within 270 calendar days.

1.5 ACKNOWLEDGEMENT OF ADDENDA

- A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
 - 1. Addendum No. 1, dated _____.
 - 2. Addendum No. 2, dated _____.
 - 3. Addendum No. 3, dated _____.
 - 4. Addendum No. 4, dated _____.

1.6 BID SUPPLEMENTS

- A. The following supplements are a part of this Bid Form and are attached hereto.
 - 1. Bid Form Supplement – Alternates.
 - 2. Bid Form Supplement - Bid Bond Form (AIA Document A310).

1.7 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Broken Arrow, Oklahoma, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.8 SUBMISSION OF BID (DOCUMENT CONTINUES ON NEXT PAGE)

SUBMISSION OF BID

Respectfully submitted this ____ day of _____, 20____.

Submitted By: _____
(Name of bidding firm or corporation)

Authorized
Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

Witness By: _____
(Handwritten signature)

Attest: _____
(Handwritten signature)

By: _____
(Type or print name)

Title: _____
(Corporate Secretary or Assistant Secretary)

Street Address: _____

City, State, Zip _____

Phone: _____

License No.: _____

Federal ID No.: _____

(Affix Corporate Seal Here)

END OF DOCUMENT 004113

NOTES

**SECTION 004313
BONDS AND CERTIFICATES**

PART 1 - GENERAL

1.1 SURETY BONDS

A. Bond Requirements

1. All bonds are for the full value of the contract and must be issued by a surety company authorized by the Oklahoma Insurance Commission to do business in the State of Oklahoma.
2. Three bonds are required for all contracts. They are:
 - a. Performance Bond to insure the completion of the work in accordance with the contract documents in the time stipulated;
 - b. Defect Bond to provide for defects in construction or materials for a period of one (1) year from the date of acceptance of the completed work; and
 - c. Payment Bond to assure the Owner is protected from the action of subcontractors, suppliers, and employees for unpaid debts of the Contractor.

Part 2 – (Not Used)

PART 3 – (Not Used)

END OF SECTION 004313

**DOCUMENT 006000
PROJECT FORMS**

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
1. AIA Document A101, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."
 - a. The General Conditions for Project are AIA Document A201-2017, "General Conditions of the Contract for Construction."
 1. The General Conditions are incorporated by reference.
 2. The Supplementary Conditions for Project are incorporated are separately prepared and included in the Project Manual.

1.2 ADMINISTRATIVE FORMS

- A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.
- B. Copies of AIA standard forms may be obtained from the American Institute of Architects; <http://www.aia.org/contractdocs/purchase/index.htm>; docspurchases@aia.org; (800) 942-7732.
- C. Preconstruction Forms:
1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."
 2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."
- D. Information and Modification Forms:
1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)," or other form approved by the Architect.
 2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."
 3. Change Order Form: AIA Document G701, "Change Order."
 4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."
 5. Form of Change Directive: AIA Document G714, "Construction Change Directive."
- E. Payment Forms:
1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."

2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF DOCUMENT 006000

**SECTION 007200
GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

ARTICLE 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. General Conditions of the Contract for Construction, American Institute of Architects' document A201™ – 2017, consisting of 15 articles and their subsections and as amended in the Supplementary Conditions (Section 007300) can be viewed at the Architect's office, or obtained online through the American Institute of Architects website www.aia.org or the local chapter office of the American Institute of Architects.

END OF SECTION 007200

**SECTION 007300
SUPPLEMENTARY CONDITIONS**

The following supplements modify AIA Document A201-2017, "General Conditions of the Contract for Construction," 2007 edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

Throughout AIA Document A201™-2017 Edition, substitute "Construction Manager" for the word "Contractor". The Construction Manager is also the Contractor in fact. Construction Manager is deemed to enter into this Contract as "CM/At Risk."

ARTICLE 1 GENERAL PROVISIONS

1.2 Correlation and Intent of the Contract Documents

1.2.1 Change the second sentence to read:

"The Contract Documents are complementary, and what is required by one shall be as binding as if required by all, and what is shown on one Drawing shall be as binding as if shown on all Drawings; 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."

Add the following subparagraphs 1.2.1.2 and 1.2.1.3 to paragraph 1.2:

1.2.1.2 In the event of conflicts or discrepancies among the Contract Documents, interpretations shall be based on the following priorities:

1. Addenda, with those of later date having precedence over those of earlier date.
2. The Supplementary Conditions.
3. The General Conditions of the Contract for Construction.
4. Division 1 of the Specifications.
5. Drawings and Division 2-49 of the Specifications. In the case of conflicts or discrepancies between Drawings and Divisions 2-49 of the Specifications, or within either Document not clarified by Addendum, the Architect will determine which takes precedence in accordance with Section 4.2.12.
6. Alternates in the contract documents

1.2.1.3 If there is a conflict between any Drawings, or Drawings and Specifications, the Construction Manager shall notify the Architect or Engineer in writing of the conflict, and request clarification in writing by the Architect or Engineer prior to bidding. If such clarification is not sought, or, if sought, is not received in a timely manner prior to bidding, the Construction Manager shall use the most expensive or best quality product or method. Failure to seek clarification of any conflict in the documents will not relieve the Construction Manager from providing in his price an amount to perform the Work.

ARTICLE 3 CONSTRUCTION MANAGER

3.2 Review of Contract Documents and Field Conditions by Construction Manager.

Change Section 3.2.2 as follows:

In the second sentence change the phrase “request for information” to “request for interpretation”.

Change Section 3.2.3 as follows:

In the first sentence change the phrase “request for information” to “request for interpretation”.

Delete the third and fourth sentences of Section 3.2.4 and substitute the following sentence:

3.2.4 “If the Construction Manager performs those obligations, the Construction Manager shall not be liable to the Owner or the Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Document, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.”

Add the following Subsection 3.2.5 to Section 3.2:

3.2.5 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Construction Manager’s requests for interpretation, where such information was available to the Construction Manager from a careful study and comparison to the Contract Documents, field conditions, other Owner-provided information, Construction Manager-prepared coordination drawings, or prior Project correspondence or documentation.

Add the following Section 3.2.6 to Section 3.2:

3.2.6 The Construction Manager shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Section 3.12.

3.4 Labor and Materials

Add the following subparagraphs 3.4.2.1 and 3.4.2.2 to paragraph 3.4.2:

3.4.2.1 After the Contract has been executed, the Owner and the Architect will consider a formal request for substitution of products in place of those specified only under the conditions set forth in Division 01 Specification Section “Product Requirements.”

3.4.2.2 By making requests of substitutions based on Subparagraph 3.4.2.1 above, the Construction Manager:

- .1** represents that the Construction Manager has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
- .2** represents that the Construction Manager will provide the same warranty for the substitution that the Construction Manager would for that specified.
- .3** certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect’s redesign costs, and waives all claims of additional costs related to the substitution which subsequently become apparent; and
- .4** will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.6 Taxes

Modify Paragraph 3.6 to read as follows:

The Owner is a not a public entity, not exempt from sales and uses taxes for the Work or portions thereof provided by the Construction Manager and its various contractors and subcontractors. The Construction Manager shall pay all applicable fees and taxes.

Add the following Section 3.6.1 to Section 3.6:

3.6.1 The Construction Manager assumes full responsibility for the payment of all contributions and payroll taxes (state and federal) as to all sub-Construction Managers, sub-contractors, and employees engaged in the performance of work pursuant hereto, and further agrees to check and meet all requirements that might be specified under regulations of the administrative official or board charged with the enforcement of any state or federal act on the subject referred to. Construction Manager agrees to furnish the Owner, upon request, a certificate or other evidence of compliance therewith.

3.10 CONSTRUCTION MANAGER'S CONSTRUCTION AND SUBMITTAL SCHEDULES

Delete subparagraph 3.10.3 and substitute the following:

3.10.3 The Construction Manager shall perform the Work in Accordance with the Construction Manager's generated and approved construction schedule within the contract time specified.

ARTICLE 7 CHANGES IN THE WORK

Delete subparagraph 7.3.7.5 and substitute the following:

7.3.7.5 Additional costs of added supervision and field office personnel only if the increased scope of Work requires added personnel, and only with the approval of the Owner.

ARTICLE 8 TIME

8.2 Progress and Completion

Change paragraph 8.2.3 to read as follows:

8.2.3 The Construction Manager shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time, and Final Completion within 30 days thereafter.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 Applications for Payment

9.3.1 Add the following sentence at the end of subparagraph 9.3.1:

"The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, latest edition, supported by AIA Document G703, Continuation Sheet, latest edition.

Add the following subparagraph 9.3.1.1 to paragraph 9.3.1:

9.3.1.1 The Owner shall pay ninety (90) percent of the amount due the Construction Manager on account of progress payments, and then increased to ninety-five (95) percent of the amount due the Construction Manager upon completion of 50 percent of the Work.

9.8 Substantial Completion

Add the following subparagraph 9.8.6 to Article 9.8:

9.8.6 Obtain Occupancy Permit issued by the local municipal authority or other authority jurisdiction, and other applicable regulatory entity and consultant-based inspections and certificates of Substantial Completion.

ARTICLE 11 INSURANCE AND BONDS

Change title to read:

11.1 Construction Manager's Insurance and Bonds

Add the following subparagraphs to paragraph 11.1.2:

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the coverages and limits of liability specified below, or greater if required by law:

1. Worker's Compensation:
 - (a) State of Oklahoma: Statutory
 - (b) Applicable Federal: Statutory
 - (c) Employer's Liability: \$500,000 per Accident
\$500,000 per Disease, Policy Limit
\$500,000 per Disease, Each Employee
2. Commercial General Liability (including Premises-Operations; Products and Completed Operations; Broad Form Property Damage):
 - (a) Each Occurrence \$1,000,000
 - (b) Personal Injury Limit \$1,000,000
3. Business Auto Liability (including owned, non-owned, and hired vehicles)
 - (a) Combined Single Limit of Liability \$2,000,000
4. Umbrella Excess Liability over Primary Insurance:
 - (a) Each Occurrence \$3,000,000

11.1.2.2 If this insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD Form 25S will be acceptable.

11.1.2.3 The maintenance of insurance by the Construction Manager and the limits of coverage required shall in no way limit or affect the extent of the Construction Manager's Liability.

Change Title of 11.2 to read: **“Property Insurance”**

11.2.1 Modify the first sentence of subparagraph 11.2.1 as follows:

“The Construction Manager 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 Construction Manager 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.

Add the following sentences to the end of subparagraph 11.2.1:

“The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Construction Manager to maintain such insurance, then the Construction Manager shall bear all reasonable costs properly attributable thereto.”

Add the following subparagraphs to 11.4:

11.4.1 Premiums for Construction Manager’s insurance are reimbursable with the exception of any unusual or additional premiums incurred due to extended time required to complete Work which exceeds all Owner-approved time extensions.

11.4.2 The Cost of Premiums for Work not completed will not be chargeable to the Owner.

11.4.3 Before an exposure to loss may occur, the Construction Manager shall file with the Owner and the Architect one certificate of insurance stating limits of coverage of this Property Insurance coverage, naming endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be cancelled or allowed to expire until at least 30 days’ prior written notice has been given to the Construction Manager, the Owner, and the Architect.

:

END OF SECTION 007300

007301
DAVIS BACON WAGE RATES

Attached in the following pages 1 through 5 are the Davis-Bacon Prevailing Wage Rates for **ROGERS and TULSA COUNTY, OKLAHOMA**, as of January 2023, as determined by the United States Department of Labor.

"General Decision Number: OK20230081 01/06/2023
Superseded General Decision Number: OK20220081 State: Oklahoma
Construction Type: Residential
RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single-family homes and apartments up to and including 4 stories).

Counties: Rogers and Tulsa Counties in Oklahoma.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single-family homes and 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).

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:	. Executive Order 14026 generally applies to the contract. . 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.
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:	. Executive Order 13658 generally applies to the contract. . 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.

** 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.

=====

END OF GENERAL DECISION"

END OF SECTION 007301

**SECTION 011000
SUMMARY**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.
9. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: CHEROKEE ADDITION SINGLE FAMILY HOMES
- B. Project Location: North Sheridan Road at North 136th East Avenue, Collinsville, Oklahoma
- C. Owner: Housing Authority of the Cherokee Nation of Oklahoma.
- D. Architect: Tri-Arch, LLC, 7320 South Yale Ave, Suite A, Tulsa, OK 74136.
- E. Contractor: Project will be performed by a General Contractor selected by competitive bidding.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

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

1. Construction of (a) single family home, three bedrooms, comply with ADA requirements.
2. Construction of exterior site improvements including grading, utilities, driveway paving, and sidewalks.

1.4 ACCESS TO SITE

- A. General: Contractor shall have unlimited use of Project site and building for construction operations during construction period,
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to the site boundaries, except as improvements are made on the municipal right-of-way to gain access to utilities and create driveways accessing primary roadways as indicated on the Drawings.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:30 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated, and as otherwise directed by Owner to accommodate regularly scheduled events, and occasional, unforeseen or seasonal services and functions.
- C. Controlled Substances: Smoking and the use of other tobacco products, and other controlled substances within the existing building and on the property is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.

1.7 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- 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": 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": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.8 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.
- D. A current list of industry and association addresses and telephone numbers is available from the Architect's office.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

**SECTION 012000
PRICE AND PAYMENT PROCEDURES**

PART 1 - GENERAL

1.1 PAYMENT PROCEDURES

- A. Submit a Schedule of Values at least seven days before the initial Application for Payment. Break down the Contract Sum into at least one line item for each Specification Section in the Project Manual table of contents. Coordinate the schedule of values with Contractor's construction schedule.
 - 1. Arrange schedule of values consistent with format of AIA Document G703.
 - 2. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 3. 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.
 - 4. Provide separate line items in the schedule of values for initial cost of materials and for total installed value of that part of the Work.
 - 5. Provide a separate line item in the schedule of values for each allowance.

- B. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

- C. Submit three copies of each application for payment according to the schedule established in Owner/Contractor Agreement.
 - 1. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor.
 - 2. With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

- D. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- E. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707-1994, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012000

**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 - GENERAL

1.1 SUBSTITUTION PROCEDURES

- A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Submit requests within 20 days after the Notice of Award.
 - 3. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
- C. Architect will review proposed substitutions and notify Contractor of their acceptance or rejection by Change Order. If necessary, Architect will request additional information or documentation for evaluation.
 - 1. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

DOCUMENT 012501
SUBSTITUTION REQUEST FORM
(During the Bidding Phase)

Project: _____ Substitution Request Number: _____
_____ From: _____
To: _____ Date: _____
_____ A/E Project Number: _____
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____

History: New Product 2-5 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified products: _____

Point-by-point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: (\$ _____).

Supporting Data Attached: Drawings Product Data Samples Tests Reports

(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution, which may subsequently become apparent, are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the work as necessary for accepted substitution will be complete in all respects.
-

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- Substitution approved – Make submittals in accordance with Specification Section _____.
- Substitution approved as noted – Make submittals in accordance with Specification Section _____.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E Other

END OF SECTION 012501

**SECTION 012600
CONTRACT MODIFICATION PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing 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 specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

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

1.4 PROPOSAL REQUEST

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or 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 time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include 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.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of product 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.
- C. Proposal Request Form: Contractor's Proposal Request form

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Architect, Owner and Contractor.
- B. Total allowable for profit shall be a fixed percentage of the cost of the Work. For Work performed by the Contractor with his own forces: ten percent (10%). For Work performed by a subcontractor: ten percent (10%) plus five percent (5%) of the amount due the subcontractor for the Contractor. In any event, the total allowed for both overhead and profit shall not exceed fifteen percent (15%) of the cost of the Work.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive. Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

**SECTION 013000
ADMINISTRATIVE REQUIREMENTS**

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Subcontract List: Submit a written summary identifying individuals or firms proposed for each portion of the Work. Use CSI Form 1.5A.
- B. Key Personnel Names: Within 15 Insert number days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. List e-mail addresses and telephone numbers.
- C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- D. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use AIA Document G716 or forms acceptable to Architect and Owner.
- E. Project Web Site: Use Architect's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion.
 - 1. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of AIA Document C106.
- F. Schedule and conduct progress meetings at Project site at regular intervals. Notify Owner and Architect of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
 - 1. Record minutes and distribute to everyone concerned, including Owner and Architect.

1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will[**not**] be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
1. 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.
 2. Submit three copies of each action submittal. Architect will return two copies.
 3. Submit two copies of each informational submittal. Architect will not return copies.
 4. Architect will return submittals, without review, received from sources other than Contractor.
- C. Paper Submittals: Place a permanent label or title block on each submittal for identification. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect. Include the following information on the label:
1. Project name.
 2. Date.
 3. Name and address of Contractor.
 4. Name and address of subcontractor or supplier.
 5. Number and title of appropriate Specification Section.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
- E. Identify options requiring selection by Architect.
- F. Identify deviations from the Contract Documents on submittals.
- G. Contractor's Construction Schedule Submittal Procedure:
1. Submit required submittals in the following format:
 - a. Working electronic copy of schedule file, where indicated.
 - b. PDF electronic file.
 - c. Two paper copies.
 2. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

- a. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
3. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
 1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.2 ACTION SUBMITTALS

- A. Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
- B. Product Data: Mark each copy to show applicable products and options. Include the following:
 1. Manufacturer's written recommendations, product specifications, and installation instructions.
 2. Wiring diagrams showing factory-installed wiring.
 3. Printed performance curves and operational range diagrams.
 4. Testing by recognized testing agency.
 5. Compliance with specified standards and requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Include the following:
 1. Dimensions and identification of products.
 2. Fabrication and installation drawings and roughing-in and setting diagrams.
 3. Wiring diagrams showing field-installed wiring.

4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurement.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.
1. If variation is inherent in material or product, submit at least [**three**] <Insert number> sets of paired units that show variations.

2.3 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
- B. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

2.4 DELEGATED DESIGN SERVICES

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

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type schedule within 30 days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

- C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
- D. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and indicate date by which recovery will be accomplished.

PART 3 - EXECUTION

3.1 SUBMITTAL 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 approval stamp before submitting to Architect.
- B. Architect will review each action submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp, and will mark stamp appropriately to indicate action.
- 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. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribute copies of approved schedule to Owner, Architect, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF SECTION 013000

**SECTION 013100
PROJECT MANAGEMENT AND COORDINATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each Sub Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

- A. Coordination: Each Sub Contractor shall coordinate its construction operations with those of other Sub Contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Sub Contractor shall coordinate its operations with operations included in different Sections, which 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 Sub 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.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. 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 limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of 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 shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment 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.
 2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
 3. Number of Copies: Submit nine opaque copies of each submittal. Architect, through Contractor, will return two copies.
 - a. Submit digital file where Coordination Drawings are required for operation and maintenance manuals. Architect will review and forward to the Owner. The reviewed submittal will be returned. Revise as needed and retain as a Project Record Drawing.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within five days of starting construction operations, submit a list of key personnel assignments to the Contractor, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: Each Sub Contractor shall, in addition to the 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 Sub Contractors.

1.6 PROJECT MEETINGS

- A. General: Contractor shall schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 1. Attendees: Inform participants and Sub Contractors involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, Contractor, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Contractor, Architect, and their consultants; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Safety.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long-lead items.
 - e. Designation of key personnel and their duties.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of Record Documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Construction waste management and recycling.
 - r. Parking availability.
 - s. Office, work, and storage areas.
 - t. Equipment deliveries and priorities.
 - u. First aid.
 - v. Security.
 - w. Progress cleaning.
 - x. Working hours.
 3. Minutes: Contractor will record and distribute meeting minutes.
- C. Pre-Installation Conferences: Contractor shall conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Safety.
 - b. The Contract Documents.
 - c. Options.
 - d. Related RFIs.
 - e. Related Change Orders.
 - f. Purchases.
 - g. Deliveries.
 - h. Submittals.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility problems.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written recommendations.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: The Contractor shall conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Contractor, and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these

- meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Safety.
 - 2) Interface requirements.
 - 3) Sequence of operations.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Status of correction of deficient items.
 - 15) Field observations.
 - 16) RFIs.
 - 17) Status of proposal requests.
 - 18) Pending changes.
 - 19) Status of Change Orders.
 - 20) Pending claims and disputes.
 - 21) Documentation of information for payment requests.
 3. Minutes: Contractor will record and distribute to Sub Contractors and participants the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response. Contractor shall maintain a log of RFI's and report their progress at each project meeting.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 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. Contractor's and Architect's Action: Contractor and Architect will review each RFI, determine action required, and return it. Allow seven 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. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- D. On receipt of Architect's action, the Contractor shall update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly.
 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 and Contractor'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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

**SECTION 013300
SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 9. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.2 DEFINITIONS

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

1.3 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect through Contractor for Sub Contractor's use in preparing submittals. Submittals consisting of architect's drawings will be rejected. Submit submittals when possible in Blue beam (PDF) with Submittal Transmittal in Word for Windows version 2007 (Word) to Architect for review.

- 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. Contractor and Architect reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Contractor will advise Sub 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 15 days for initial review of each submittal.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4" wide the full page height beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of Sub Contractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.

- 1) Submittal number shall use Specification Section number followed by the submittal number of that section (e.g. 1.4) followed by a number 0 for the first submittal. Revisions would follow in sequence – e.g. 095113.1.4.0 is first submittal, 095113.1.4.1 is first revision.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
 4. Electronic PDF submittal files shall be named utilizing the specification number followed by a sequential number for the submittal made under the given specification number followed by “r#” if it is a re-submittal, and then followed by a brief description of the submitted item.
 - a. The description shall indicate the actual item submitted, shall not be general in nature, and does not have to be that of the specification section heading.
 - b. Using the example, “230519-4r2 Differential Pressure Gauge”; 230519 – Meters and Gages for HVAC Piping is the relevant specification, the “4” shows it was the fourth submittal for specification section 230519, “r2” shows it was the second re-submittal, and the description indicates what item is submitted.
 - c. Each specification item shall be submitted in a separate PDF file. PDF files with multiple specification items will be returned without review.
 - d. Each file shall have sufficient space allowance for the Architects review stamp(s).
 - e. Each file shall have the Contractor’s review stamp(s) and indicate information required by specification 013300 – 1.4, E.3.
 5. All marks made by the Contractor shall be in green.
- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 1. Submit one electronic copy in PDF format of each submittal to concurrent reviewer in addition to Contractor and Architect.
 2. Copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, discard submittals received from sources other than Contractor.
 1. Transmittal Form: Provide locations on form for the following information:

- a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
- 2. 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.
 - 3. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
- I. 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 via clouds or other distinguishing feature.
 - J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be for Contractor's use in connection with Project, subject to the following conditions:
 - 1. Electronic File Transfer Request Section 013310 is at the end of this section for the Contractor's use.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit one electronic copy in PDF format of each submittal. Architect will review and mark up in red as required and return to the Contractor the same PDF marked up.
- 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.
 5. Number of Copies: Submit one electronic copy in PDF format of Product Data, unless otherwise indicated. Architect, through Contractor, will return reviewed submittal. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. 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. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
 3. Number of Copies: Submit one electronic copy in PDF format of each submittal to Contractor. Architect, through Contractor, will return one copy.
 4. Number of Copies: Submit one electronic copy in PDF format where copies are required for operation and maintenance manuals. Trade Contractor will incorporate drawings into project record documents, refer 017839, 1.3, markup and retain one returned copy as a project record drawing.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Comply with all sample requirements as indicated in individual specification sections.
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.
 - e. Area for architectural stamp.
 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 the Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit 5 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's

product line. Architect, through Contractor, will return submittal with options selected.

5. 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 five sets of Samples. Architect and Contractor will retain three Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least five sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit product schedule or list in PDF format, unless otherwise indicated. Architect, through Construction Manager, will return reviewed schedule.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Contractor's action.
- G. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

- J. Subcontract List: Contractor shall prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit subcontractor list, unless otherwise indicated.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit in PDF format Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit one electronic copy in PDF format of each submittal. Architect will review and mark up as required in red and return to the Contractor the same PDF marked up.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during

installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Material Safety Data Sheets (MSDSs): Submit information to Construction Manager.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Trade 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 one electronic copy in PDF format 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 CONSTRUCTION MANAGER'S REVIEW

- A. Construction Manager shall review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. 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 Construction Manager's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S / ACTION

- A. General: Architect will not review submittals that do not bear Construction Manager's approval stamp and will return them without action.
- B. Action Submittals: Construction Manager and Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "No Exception Taken", the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.

2. Final-But-Restricted Release: When the Architect marks a submittal “Make Corrections Noted”, the Work covered by the submittal may proceed provided it complies with the notations or corrections on the submittal and requirements of the Contract Documents.
 3. Returned for Re-submittal: When the Architect marks a submittal “Revise and Resubmit”, do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
- C. Informational Submittals: Contractor and Architect will review each submittal and will return it “Action Not Required”, or will return it without stamp if it does not comply with requirements.
- D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

**SECTION 014000
QUALITY REQUIREMENTS**

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. 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.
- B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Architect for a decision.
- C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision.
- D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- E. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.

- F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- G. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- H. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
- I. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.
- J. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- K. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor of irregularities or deficiencies in the Work observed during performance of its services.
 - 2. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - 3. Do not perform any duties of Contractor.
- L. Associated Services: Cooperate with testing agencies and provide reasonable auxiliary services as requested. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Security and protection for samples and for testing and inspecting equipment.

- M. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- N. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction.
- O. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- 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": 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": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. A current list of industry and association addresses and telephone numbers is available from the Architect's office.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Code 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.

IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials (See ICC)
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.

- B. Federal Government 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.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)

NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
RUS	Rural Utilities Service (See USDA)
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

- 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

**SECTION 015000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes minimum quality requirements for temporary utilities, support facilities, and security and protection facilities. The Contractor, using the base criteria will propose to the Architect and Owner services, facilities, and controls to be used. An invoice to the Owner will be submitted and paid for as a separate payment.

- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
 - 4. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contractor's proposal to the Owner. 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. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

- C. Water Service: Pay water service use charges for usage by all entities for construction operations. Provide connections and extensions of services as required for construction operations.

- D. Electric Power Service: Pay electric power service usage charges for usage by all entities for construction operations. Provide connections and extensions for construction operations.

1.4 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 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: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 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 MATERIALS

- A. Pavement: Comply with Division 32 Pavement Sections.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
- C. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."
- D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- F. Paint: Comply with requirements in Division 09 painting Sections.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

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 UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with Contractor, utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. 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.
- F. Electric Power Service: Install electric service.
- G. 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.
 - 2. Install lighting for Project identification sign.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install a minimum of two telephone line(s) for each field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion or as required by the Contractor. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Use designated areas as directed by Contractor.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Temporary Signs: Provide job sign as detailed on drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
1. Provide temporary, directional signs for construction personnel and visitors.
 2. Maintain and touchup signs so they are legible at all times.
- G. Contractor shall provide hoists, lifts, (exclusive of project elevators and escalators) for delivery of materials, supplies and personnel. Project elevators and escalators shall not be used for delivery of materials, supplies and personnel. Use of project elevators and escalators shall be limited to those authorized by Owner and Architect.
- H. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

- I. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
- J. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
 - 1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
 - 2. Construction Site Lighting: During hours of darkness provide perimeter lighting along line of construction fence and area lighting within construction site furnishing 1.5 foot-candles of illumination at ground level. Provide 5.0 foot-candles of illumination at all gates and entrances to temporary buildings and new structures under construction. Make provisions for operation of lighting during power failures and include automatic re-start.
- K. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- L. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- H. 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 hazardous fire-exposure construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. 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.
 - 4. 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.

3.5 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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion or as agreed upon with the Construction Manager.

- E. 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 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.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

END OF SECTION 015000

**SECTION 015700
SLOPE PROTECTION AND EROSION CONTROL**

PART 1 - GENERAL

1.1 SUMMARY

- A. Installation of temporary and permanent erosion control systems.
- B. Installation of temporary and permanent slope protection systems.

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Division 31 Sections pertaining to earthwork and preparation.
- B. Division 32 Sections pertaining to paving, site structures and plantings.
- C. Division 33 Section pertaining to site drainage structure.
- D. Construction Drawings.
- E. Applicable Local, State, and Federal specifications or requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent properties and water resources from erosion and sediment damage throughout life of contract.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Quick growing grasses: wheat, rye, or oats in accordance with Sections labeled "Seeding" and "Sodding".
- B. Fencing for siltation control as specified on Construction Drawings.
- C. Bale stakes for each bale shall be minimum of 4-feet in length and shall be either two #2 rebars, two steel pickets, or two 2-inch x 2-inch hardwood stakes driven 1'-6" into ground.
- D. Temporary mulches such as loose hay, straw, netting, wood cellulose, or agricultural silage.
- E. Fence stakes shall be minimum of 5-ft in length and be either metal stakes or 2-inch x 2-inch hardwood stakes driven 1'-6" into ground.
- F. Temporary and Permanent Outfall Structures as specified on Construction Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review Construction Drawings and Storm Water Pollution Prevention Plan.
- B. Deficiencies or changes on Construction Drawings or Storm Water Pollution Prevention Plan as it is applied to current conditions shall be brought to the attention of Owner for remedial action.

3.2 EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

- A. Place erosion control systems in accordance with Construction Drawings and Storm Water Pollution Prevention Plan or as may be dictated by site conditions in order to maintain the intent of the specifications and permits at no additional cost to Owner.
- B. Engineer has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures. Contractor will be required to incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls. Permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.
- C. Maintain temporary erosion control systems as directed by Engineer or governing authorities to control siltation during life of contract. Contractor shall respond to maintenance or additional work ordered by Engineer or governing authorities within 48 hours or sooner if required.
- D. Slopes that erode easily or that will not be graded for a period of 14 days or more shall be temporarily seeded as work progresses with wheat, rye, or oats application in accordance with Section labeled "Landscaping" unless otherwise specified on the Construction Drawings.

END OF SECTION 015700

**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "References" for applicable industry standards for products specified.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 3. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use form provided by Architect at end of Section.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings, samples and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 3. Architect's Action:
 - a. Pre-Bid Substitution Form of Acceptance: **Addendum only.**
 - b. Post-Bid Substitution Form of Acceptance: **Change Order only.**
 - c. If Architect does not indicate Acceptance or Approval through addendum or change order, use specified product.

- d. No notification will be issued of proposed substitutions not approved by Architect.
 - e. The Architect's & Owner's decision of approval or disapproval of a proposed substitution shall be final.
- B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
- 1. Architect's Action:
 - a. Acceptance of Comparable Product will be indicated through addendum or deduct change order only
 - b. If Architect does not indicate Acceptance or Approval through addendum or change order, use specified product.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- 1. Each sub contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between sub contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
- 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner and Contractor.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor or Sub Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 1 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, that complies with requirements.
 7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system.
 8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply

- with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRE-BID PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received not less than 10 days prior to the date scheduled for receipt of bids. Requests submitted after the above time period will not be considered and no notification will be issued to Contractor of requested substitutions.
- B. Materials, products, and equipment described in Contract Documents establish a minimum standard of required function, dimensions, appearance, and quality to be met by any proposed substitution.
- C. Conditions: Architect will consider requests for substitution when the following conditions are satisfied. The burden of proof of the merit of the requested substitution is upon the proposer. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements. Entity initiating request shall fill out Substitution Request Form and submit documentation stipulated in paragraph 1.4.A.2, section 016000.
 1. **Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, (which would be deducted from the Contractor's application for payment from the Owner) increased cost of other construction by Owner, and similar considerations.**
 2. Substitution request is timely, fully documented and properly submitted.

3. Evidence that the proposed product does not require extensive revisions to the Contract Documents.
4. Bidder will pay for changes to the building design, including engineering design, detailing, and construction cost caused by the use of proposed substitute.
5. Requested substitution is consistent with the Contract Documents and will produce the indicated results.
6. Bidder has investigated proposed substitute and determined that meets or exceeds the quality level of specified Product.
7. Requested substitution provides specified warranty.
8. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
9. Requested substitution is compatible with other portions of the Work.
10. Requested substitution has been coordinated with other portions of the Work.
11. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
12. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
13. Samples, if requested.
14. Requested substitution will not adversely affect Contractor's Construction Schedule.
15. Sub Contractor or Supplier shall submit documentation from manufacturer or material supplier of specified product certifying that specified Product cannot be provided within the Contract Time.
16. Requested substitution has received necessary approvals of authorities having jurisdiction.

D. Each request includes the following:

1. Written request in form and procedures required for Change Order proposals.
2. Identification of specification Section number, Paragraph number, and name and description of specified material, Product, or equipment for which substitution is requested.
 - a. Include items specifically required as Submittals in individual specification Sections.
 - b. Substitution request not including sufficient information necessary for an evaluation by the Architect will not be approved, nor will Architect contact entity requesting substitution in order to obtain additional information.
3. Description of changes to the Contract Documents which proposed substitute will require for its proper installation.
4. Sub Contractor or Supplier has determined that maintenance and repair parts will be locally available for requested substitute.
5. Contractor has reviewed and approves request as fully complying with the specifications.

- E. Sub Contractor's submittal and acceptance by Architect of Product Data, Shop Drawings, Samples, manufacturer's installation instructions, manufacturer's certificates, or test reports for Products not complying with Contract Documents will not constitute valid request for substitution request, acceptance of substitution request or approval of substitution request unless accompanied by substitution request form and substitution is clearly defined and noncompliant nature clearly disclosed.
- F. The Architect's and Owner's decision of approval or disapproval of a requested substitution shall be final.
 - 1. No notification will be issued of requested substitutions not approved by Architect and Owner.

2.3 POST-BID PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 60 days after date of agreement between Owner and Contractor or 60 days after date of Notice to proceed, whichever is earlier.
- B. Requests submitted after the above time period will not be considered and no notification will be issued to Contractor of requested substitutions.
- C. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. The burden of proof of the merit of the requested substitution is upon the proposer. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements. Entity initiating request shall fill out Substitution Request Form and submit documentation stipulated in paragraph 1.3.A.2, section 016000.
 - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, (which would be deducted from the Contractor's application for payment from the Owner) increased cost of other construction by Owner, and similar considerations.
 - 2. Substitution request is timely, fully documented and properly submitted.
 - 3. Evidence that the proposed product does not require extensive revisions to the Contract Documents.
 - 4. Requested substitution is consistent with the Contract Documents and will produce the indicated results.
 - 5. Specified Product cannot be provided within the Contract Time.
 - a. Contractor shall submit documentation from manufacturer or material supplier of specified product certifying that specified Product cannot be provided within the Contract Time.

- b. Substitution request will not be considered if Product cannot be provided as a result of failure of Contractor to pursue Work promptly or coordinate Work properly.
6. Specified Product cannot receive necessary approval by authority having jurisdiction and requested substitution can be approved.
 - a. Contractor shall submit documentation from authority having jurisdiction certifying that specified Product cannot receive necessary approval.
7. Specified Product cannot be provided in a manner compatible with other specified Products and Contractor certifies requested substitute will overcome incompatibility.
 - a. Contractor shall submit evidence that specified Product cannot be provided in a manner compatible with other specified Products.
8. Specified Product cannot be coordinated with other specified Products and Contractor certifies requested substitute can be coordinated.
 - a. Contractor shall submit evidence that specified Product cannot be coordinated with other specified Products.
9. Requested substitution has received necessary approvals of authorities having jurisdiction.
10. Sub Contractor or Supplier shall submit documentation from manufacturer or material supplier of specified product certifying that specified Product cannot be provided within the Contract Time.
11. Substitution request will not be considered if Product cannot be provided as a result of failure of Sub Contractor or Supplier to pursue Work promptly or coordinate Work properly.

D. Each request includes the following:

1. Four copies of written request in form and procedures required for Change Order proposals.
2. Identification of specification Section number, Paragraph number, and name and description of specified material, Product, or equipment for which substitution is requested.
3. Complete description of the requested substitute including product data, drawings, samples, performance and test data, and other information necessary for an evaluation by the Architect and Owner.
 - a. Include items specifically required as Submittals in individual specification Sections.
 - b. Detailed comparison of qualities of requested substitution with specified Product.
 - c. Architect may request additional information or documentation for evaluation.

- d. Description of changes to the Contract Documents which requested substitute will require for its proper installation.
- e. Description of changes or modifications needed to other parts of the Work and to construction performed by Owner and Owner's separate contractors, that will be necessary to accommodate requested substitution.
- f. Contractor's statement indicating requested substitution's effect on Construction Manager's Construction Progress Schedule compared to schedule without acceptance of requested substitution.
 - 1) Indicate requested substitution's effect on overall Contract Time.
- g. Cost information including a proposal of the net change, if any, in Contract Sum.
- h. Construction Manager's certificate of waiver of rights for claim of addition in Contract Sum or extension in Contract Time that may subsequently become necessary because of requested substitution's failure to perform adequately.

2.4 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Construction Manager's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1. Requests for comparable products are to be submitted per Pre-Bid Substitutions and Post-Bid Substitutions procedure described in this Section.

PART 3 - EXECUTION

3.1 SUBSTITUTION REQUEST FORM

- A. The form on the following page(s) is a summary of responses required by A/E. This form shall accompany the submittal requirements per Section 016000, Paragraphs 1.4.A. List all attachments.

END OF SECTION 016000

SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

From: _____

To: _____ Date: _____

A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No: _____

Installer: _____ Address: _____ Phone: _____

History: New product 2-5 yrs old 5-10 yrs old More than 10 yrs old

Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain: _____

Savings to Owner for accepting substitution: _____ (\$ _____)

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days

Supporting Data Attached: Drawings Product Data Samples Tests Reports

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades. And will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution, which may subsequently become apparent, are to be waived including electrical power and phase required or other utility requirements for size and demand caused by the substitution.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: Subcontractor - _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachment: (Letters from Vendor and Manufacturer)

Contractor Approval: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E

**SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for preparing or executing the following:
 - 1. Execution requirements.
 - 2. Substantial and Final Completion procedures.
 - 3. Preparing closeout Submittals including Record Drawings, Record Specifications, Record Project Data and Miscellaneous Submittals, Project Warranties.
 - 4. Requirements for Field Engineering, installation, and cutting and patching.
 - 5. Project cleaning.
 - 6. Repair of the Work.
 - 7. Demonstration and Training.

1.2 EXECUTION REQUIREMENTS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Cutting and Patching:
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.3 CLOSEOUT SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.
- C. Operation and Maintenance Data: Submit two copies of manual.
- D. PDF Electronic File: Assemble manual into a composite electronically indexed file. Submit on digital media.

- E. Record Drawings: Submit two sets of marked-up record prints.
- F. Record Digital Data Files: Submit data file and one set(s) of plots.
- G. Record Product Data: Submit one paper copy and one annotated PDF electronic files and directories of each submittal.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
- B. Submittals Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other sections, including project record documents, operation and maintenance manuals, property surveys, similar final record information, warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in other sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect.
 - 4. Submit test/adjust/balance records.
 - 5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Advise Owner of changeover in heat and other utilities.
 - 6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 7. Remove temporary facilities and controls.
 - 8. Complete final cleaning requirements, including touchup painting.
 - 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will proceed with inspection or advise Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment.
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.

- B. 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 final Certificate for Payment after inspection or will advise Contractor of items 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

- B. 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.

2.2 RECORD DRAWINGS

- A. Record Prints: Maintain a set of prints of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. Record data as soon as possible after obtaining it. Mark with erasable, red-colored pencil to show actual installation where installation varies from that shown originally, and mark with other colors to show subsequent changes at same location. Accurately record information in an acceptable drawing technique.
 - 1. Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location, along with Project name, and names of Architect and Contractor(s).
 - 2. Information on concealed elements that would be difficult to identify or measure and record later.

- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings.
 - 1. Format: Annotated PDF electronic file.

2.3 RECORD SPECIFICATIONS

- A. Mark Specifications to indicate the actual product installation where installation varies from that originally indicated in Specifications, addenda, and contract modifications. Especially note the following:
 - 1. Information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. The proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. The name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.4 RECORD PRODUCT DATA AND MISCELLANEOUS SUBMITTALS

- A. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal. Especially note the following:
 - 1. 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. Related Change Orders, record Specifications, and record Drawings where applicable.
- B. Assemble Miscellaneous Records required by other Sections for record keeping and submittal in connection with actual performance of the Work. Bind or file and identify each, ready for continued use and reference.
- C. Format: Annotated PDF electronic file, or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

2.5 PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty and bond documents into an orderly sequence based on the Project Manual Table of Contents.

1. Bind in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, sized to receive 8-1/2-by-11-inch paper, identified with the typed or printed title "WARRANTIES," Project name, and name of Contractor on the binder's front and spine
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty and to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Warranty Electronic File: Scan warranties and bonds and assemble into a single indexed electronic PDF file. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
- B. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Verify compatibility with and suitability of substrates.
 2. Examine roughing-in for mechanical and electrical systems.
 3. Examine walls, floors, and roofs for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.2 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

- A. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.
- B. Engage a registered land surveyor to lay out the Work using accepted surveying practices.

- C. Engage a registered land surveyor to prepare a final property survey showing significant features (real property) for Project.
 - 1. At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.3 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations.
- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.
- E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
- F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Provide temporary support of work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Cutting: Cut in-place construction using methods least likely to damage elements retained or adjoining construction.

1. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- D. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
 2. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.
 3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3.5 CLEANING

- A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 3. Remove debris from concealed spaces before enclosing the space.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 3. Remove labels that are not permanent.
 4. Clean transparent materials, including mirrors. Remove excess glazing compounds.
 5. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
 6. Vacuum carpeted surfaces and wax resilient flooring where product is so indicated.
 7. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.
 8. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.6 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

- B. Repair or remove and replace defective construction, including replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Provide replacements where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 2. Replace burned-out or noticeably dimmed bulbs, and defective and noisy starters.

3.7 SUBMITTALS AND RECORD DOCUMENTS

- A. Submittals: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

3.8 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
 - 1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION 017000

**SECTION 017123
FIELD ENGINEERING**

PART 1 - GENERAL

1.01 SUMMARY

- A. The Contractor shall provide construction stakeout sufficient to construct the proposed improvement in accordance with the approved construction plans.
- B. All stakeout services shall be completed under the direct supervision of a Professional Land Surveyor licensed in the State where the project is located.
- C. The Owner shall provide the following prior to the commencement of any stake-out services:
 - 1. Construction site drawings and associated electronic files.
 - 2. Copies of the topographic survey that the approved site plans have been based on. The topographic survey shall include at least one benchmark, which shall be used for vertical control; and,
 - 3. Copies of the boundary survey that the approved site plans have been based on. The boundary survey shall be closed and monumented/ironed. These monuments/irons shall be used for horizontal control related to the site boundary and the dimensional control plan.
- D. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The Contractor/Surveyor shall supply all stakeout materials.

2.02 EQUIPMENT

- A. The Contractor/Surveyor shall supply all equipment necessary to accomplish the work.

PART 3 - EXECUTION

3.01 PERFORMANCE STANDARDS

- A. Building Layout

1. Set a minimum of 4 building corners (to be the outer most building limits or as requested by the Contractor) with 2 (10 foot minimum) offsets per corner. A benchmark or a finished floor benchmark will be set within close proximity to the proposed building.
- B. Building Pad/Limits Certification
1. Grade elevations for the building limits (finished floor elevation) shall be provided at a 50 foot grid for subgrade acceptance, stone base acceptance, and prior to slab placement.
- C. Detention/Retention Ponds and Storm Drainage
1. The Contractor shall provide an as-built survey of all constructed detention/retention ponds and associated drainage structures prior to final acceptance, including a written certification verifying the constructed pond volume and inverts of the proposed drainage structures.
- D. Curb Layout
1. Stakes shall be located at a minimum of 25 feet and a maximum of 50 feet intervals and also at points of curvature, points of tangency, radius points, and transitions, high and low points, and deflections. Offsets will be at 4 feet from face of curb, elevations to top of curb, elevations of top of curb to be provided at this 4 foot offset.
- E. Storm and Sanitary Manholes
1. 15 feet and 25 feet offset stakes in the same direction will be set from the centerline opening of structure lath. One offset stake will have an elevation to top of rim and inverts. Intermediate grade stakes to pipe invert elevation will be provided if needed. (Note: These stakes are not to conflict with piping.) Catch Basins
 2. Set a centerline of structure lath with 10 foot offset HUB along the face of curb on either side of the lath at face of curb. One offset stake will have an elevation to top of grate and inverts.
 3. (Note: These stakes are not to conflict with piping.)
- F. Utility Layout
1. Water – Stakes shall be located at 50 foot intervals along centerline of pipe and at deflections with no offsets. One 10 foot offset stake to the center of hydrant with a grade ring elevation will be provided;
 2. Lighting – Centerline of lighting structure with a 5 foot offset will be staked. Offset stake elevation will be to finished grade; and,
 3. Centerline of pipes will be staked with no offset.
- G. Roadway Layout

1. Grade stakes shall be located at centerline of roadway at 50 foot intervals, including point of curvature, point on curve, point of tangency, and points of vertical curves. Grades shall be at finished grade.

H. Wall Layout

1. Stakes with 10 feet offset shall be provided at 50 feet intervals, deflections, beginning and end of wall. Additional stakes may be required, depending on wall height and conditions.

I. Limits of Disturbance

1. Clearing limits shall be staked at 100 feet \pm intervals and at all critical areas.

J. Grade Stakes

1. Stakes will be provided at a 50 foot grid. Grade elevations shall be to finished grade.

3.02 CONTRACTOR VERIFICATION

- A. Contractor will field verify the utility location, size and invert elevations at points of connection in area of conflict, prior to construction and protect them from damage.
1. Finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade;
 2. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks; and,
- B. Notify Owner if it is necessary to destroy or remove control points and/or benchmarks due to construction. Contractor shall be responsible for the protection of benchmarks, including the cost for relocation as required.
- C. Advise Owner of any discrepancies between plans and field layout.

3.03 QUALITY ASSURANCE

- A. The survey crew shall discuss all layout procedures with the Contractor's supervisor prior to commencing work.
- B. A survey crew daily report detailing that day's work, shall be completed and signed by the Contractor's supervisor at the end of that day's layout.
- C. Copies of sketches, cut sheets, etc. shall be provided to the Contractor by the beginning of the next workday.
- D. All costs related to re-staking due to construction or Contractors' work resulting in destruction or movement of stakes, shall be paid for by the Contractor and at no additional expense to the Owner.

- E. Building dimensions shall be obtained only from the approved architectural/structural drawings. Dimensions are to be obtained only from the appropriate approved (engineering, architectural and structural) drawings. The surveyor shall report any conflicts to the Contractor and Owner.

END OF SECTION 017123

**SECTION 017300
EXECUTION**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

- A. Qualification Data: For professional engineer.

- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

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

- D. Certified Surveys: Submit electronic file in pdf format signed by professional engineer.

- E. Final Property Survey: Submit electronic file in pdf format showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect and Contractor when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
 7. Benchmarks and control points destroyed or disturbed by Sub Contractors shall be replaced with a licensed surveyor at the expense of the responsible Sub Contractor.
 8. All other survey and layout of the work is to be done by the Sub Contractor.

- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Contractor.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Contractor. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Contractor before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Contractor shall establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Pre-Installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

**SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 - GENERAL

1.1 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 "Summary" for coordination of responsibilities for waste management.
 - 2. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
 - 3. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction or repair operations. Construction waste includes packaging.

- B. Demolition Waste: Site improvement materials resulting from demolition or selective demolition operations.

- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

- E. Salvage: Recovery of demolition or construction waste and subsequent sale, donation or reuse in another facility.

1.3 PERFORMANCE GOALS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work.

- B. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
 - 1. Demolition Waste:
 - a. Asphaltic concrete paving.

- b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Refrigerants.
 - e. Electrical conduit.
 - f. Copper wiring.
2. Construction Waste:
- a. Site-clearing waste.
 - b. Masonry and CMU.
 - c. Lumber.
 - d. Wood sheet materials.
 - e. Wood trim.
 - f. Metals.
 - g. Roofing.
 - h. Insulation.
 - i. Carpet.
 - j. Gypsum board.
 - k. Piping.
 - l. Electrical conduit.
 - m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.4 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan 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. Qualification Data: For refrigerant recovery technician.
- G. 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.

1.5 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 its disposition.
 - 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.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- 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, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 4. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.
- E. Forms: Prepare waste management plan on forms included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect, Owner, and Construction Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. 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 everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
 - 1. CMC Recycling
 - 2. National Waste Recycling
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- D. 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.

3.4 RECYCLING CONSTRUCTION WASTE

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

2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.
1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.
- 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.
 - a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.5 DISPOSAL OF WASTE

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

END OF SECTION 017419

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.

- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 SUBMITTALS

- A. The Contractor shall receive from the Sub Contractors manuals, documents, and lists as stipulated in Section 017823 in the quantities required. It shall be the Contractor's responsibility to organize the Operation and Maintenance Data in their final form and submit for the Architect's review and approval.
- B. Initial Submittal: Submit 1 draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

- C. Final Submittal: Submit 1 copies of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 4 copies of each corrected manual within 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 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.

- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 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.

2.4 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.

2.5 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, and telephone number 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.

2.6 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, and telephone number 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. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. 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.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. 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.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete 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.
- F. 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.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- G. 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 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.

- B. Related Sections include the following:
 - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal: Submit one electronic copy in PDF format. Architect will initial and date each print and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return marked up set for organizing into sets, printing, binding, and final submittal.
 - b. Final Submittal: Submit one electronic copy in PDF format and (1) set of marked-up Record Drawings. Print each Drawing, whether or not changes and additional information were recorded.

- B. Record Product Data: Submit copies of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

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 erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 - 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Consult Architect and Contractor for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
 - 3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Trade Contractor.

2.2 RECORD SPECIFICATIONS

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

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project. Contractor, at their option, may review project record documents prior to accepting any payment request. Contractor may reject payment request will record documents are correct.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Contractor's reference during normal working hours.

END OF SECTION 017839

**SECTION 018913
SITE PREPARATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
- B. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.
- C. Stripping topsoil from areas that are to be incorporated into limits of project and where so indicated on Construction Drawings.

1.2 RELATED SECTIONS

- A. Division 01 Section labeled "Slope Protection and Erosion Control".A.
- B. Division 02 Section "Demolition".
- C. Division 31 Section "Earthwork".

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Construct temporary erosion control systems as shown on Drawings or as directed by "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.
- B. In event that sitework on this project will disturb five (5) or more acres, Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.
- C. The Contractor shall be fully responsible for the preparation of the "Storm Water Pollution Prevention Plan" unless the Owner or the Engineer has supplied one to them. The Erosion Control Plan within the Drawings shall only be used as a guide and is not intended to be a fully developed "Storm Water Pollution Prevention Plan".
- D. Contractor shall be totally responsible for conducting storm water management practices in accordance with NPDES permit and for enforcement action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.4 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practical.
- B. Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to attention of the Engineer prior to commencement of sitework.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Off-site materials shall be transported 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their safety throughout construction operations.

3.2 PROTECTION

- A. Locate and identify existing utilities that are to remain and protect these from damage.
- B. Protect trees, plant growth, and features designated to remain.
- C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by SWPPP or governing authority. Dust control shall be provided with equipment provided by Contractor.
- D. 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.
- E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

3.3 CLEARING

- A. Clear areas required for access to site and execution of work.

- B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section labeled "Earthwork".
- C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

3.4 TOPSOIL EXCAVATION

- A. Topsoil shall consist of organic superficial soil found in depth of not less than 6-inches. Satisfactory topsoil shall be reasonably free of subsoil, clay lumps, stones and other objects over 2-inches in diameter, weeds, roots, and other objectionable material.
- B. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.
- C. Strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.
- D. Stockpile topsoil in storage piles in areas shown on Drawings or where directed by Engineer. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material.

END OF SECTION 018913

**SECTION 033000
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data concrete mix designs and submittals required by ACI 301.
- B. Ready-Mixed Concrete Producer Qualifications: ASTM C 94/C 94M.
- C. Comply with ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain Steel Wire: ASTM A 82, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, as drawn, flat sheet.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- E. Portland Cement: ASTM C 150, Type I or II.
- F. Fly Ash: ASTM C 618, Type C or F.
- G. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- H. Silica Fume: ASTM C 1240, amorphous silica.
- I. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inch nominal for foundations, stem walls and slabs on grade; 1 inch nominal for elevated slabs.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- J. Air-Entraining Admixture: ASTM C 260.

- K. 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.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- L. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures.
- M. Vapor Retarder: Reinforced sheet, ASTM E 1745, Class A.
- N. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- O. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- P. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- Q. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- R. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.2 MIXES

- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Proportion normal-weight concrete mixture for Footings and Piers as follows:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days or as shown on drawings.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.57.
 - 3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 - 4. Slump Limit: 6 inches, plus or minus 1 inch.
 - 5. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- C. Proportion normal-weight concrete mixture for Slabs-on-Grade as follows:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days or as shown on drawings.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Minimum Cementitious Materials Content: 470 lb/cu. yd.

4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content: Do not allow air content of troweled finished slabs to exceed 3 percent.
- D. Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116.
1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONCRETING

- A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch for concrete exposed to view and Class C, 1/2 inch for other concrete surfaces.
- B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches and sealed.
- C. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- D. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.
- E. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.
- F. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- G. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.
- H. Slab Finishes: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:
 1. Scratch finish for surfaces to receive mortar setting beds.
 2. Float finish for interior steps and ramps and surfaces to receive waterproofing, roofing, or other direct-applied material.
 3. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
 4. Trowel and fine-broom finish for surfaces to receive thin-set tile.
 5. Nonslip-broom finish to exterior concrete platforms, steps, and ramps.
- I. Cure formed surfaces by moist curing for at least seven days.
- J. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days or Apply membrane-forming curing compound to concrete

- K. Owner will engage a testing agency to perform field tests and to submit test reports.
- L. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

END OF SECTION 033000

**SECTION 042113
BRICK MASONRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the applications of brick masonry anchored to wood framing and sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

- A. Protection of Brick Masonry: Cover tops of walls with waterproof sheeting at end of each day's work.
- 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.
 - 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.
- C. Hot-Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602 requirements.

PART 2 - PRODUCTS

2.1 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.
- B. Face Brick: Facing brick complying with ASTM C 216.
 - 1. Products: Type 1 (Field Brick): Selected by Architect to match existing building.
 - 2. Type: FBX.
 - 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 4. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long, unless another size to match existing brick is indicated.

2.2 MORTAR 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.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
- D. Water: Potable.

2.3 JOINT REINFORCEMENT AND VENEER ANCHORS

- A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
- B. Materials: Hot-Dip Galvanized-Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
- C. Adjustable Veneer Anchors:
 - 1. Available Product: Hohmann & Barnard, Inc.: DW-10; DW-10HS.
 - 2. Anchor Section: Sheet metal plate, with two screws.
 - 3. Wire Ties: 3/16-inch diameter wire, 2X hook, Type 304 stainless steel U-shaped double pintle.

2.4 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces.

2.5 MORTAR MIXES

- 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 and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144.

- E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C.

2.6 CAVITY WALL FLASHING/DRAINAGE SYSTEM

- A. Weep/Vent Products: Use the following in brick veneer cavity walls, and in head joints at top of walls to permit cavity air circulation.
 - 1. Basis-of-Design Product: Mortar Net USA, Ltd.; Mortar Net Weep Vents.
- B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Available Product: Mortar Net USA, Ltd.; Mortar Net.
 - 2. Configuration: Strips, not less than 1-1/2 inches (38 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

2.7 EMBEDDED FLASHING MATERIALS

- A. Rubberized-Asphalt Flexible Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
- B. 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.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type N unless another type is indicated.
- C. Moisture-Repellent Admixture: W.R. Grace Co.; Dri-Block.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.
- B. Lines and Levels: Do not vary from the following dimensions:
 - 1. Bed joints: 1/4 inch in 10 feet, or 1/2-inch, maximum.
 - 2. Conspicuous horizontal lines, lintels, sills, parapets, and reveals: 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. Vertical lines and surfaces: From plumb: 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 4. Conspicuous vertical lines, external corners: 1/8 inch in 10 feet, or 1/2 inch maximum.
 - 5. Lines and surfaces, from straight: 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
- C. Joints: Do not vary from the following dimensions:
 - 1. Bed joint thickness: 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. Head and collar joints: 3/8 inch or minus 1/4 inch.
 - 3. Exposed head joints: Plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following patterns:
 - 1. Running bond.
 - 2. Soldier course, with stacked batts at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.

3.4 ANCHORING MASONRY VENEERS

- A. Prior to starting installation of anchor sections, install self-adhering, self-sealing adhesive tape in continuous lengths from bottom of wall to top of wall behind anchor sections. Roll on with evenly distributed pressure applied with 3-inch-wide roller. Install directly on top of sheathing surface and before installing weather barrier.
- B. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 1. Lay truss reinforcing in brick masonry joints at spacing indicated on structural drawings or in concrete unit masonry specification section.
 - 2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of concrete unit masonry. Void will be filled with rigid insulation board.
 - 3. Space anchors not more than 16 inches o.c. vertically.

3.5 TOOLING

- A. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile: Concave.

3.6 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean brick masonry as work progresses. Remove mortar fins and smears before tooling joints.

3.7 EXCESS MATERIALS AND WASTE

- A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

END OF SECTION 042113

SECTION 044313
ADHERED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone masonry adhered to wood framing and plywood sheathing.

B. Related Requirements:

1. Division 06 Section "Sheathing" for sheathing board back-up and weather-resistant building paper.

1.2 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

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.

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.

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

PART 2 - PRODUCTS

2.1 MANUFACTURED STONE VENEER

A. Varieties and Sources: Subject to compliance with requirements, provide manufactured stone products matching existing installed products, based on the following original specification:

1. "Urestone", Replications Unlimited, Hazelwood, MO 63042.
2. Other product selected by Owner and Architect.

2.2 MISCELLANEOUS MASONRY ACCESSORIES

A. Water Resistive Barrier: Provide the following dual-layer system beneath the lath and mortar.

1. One layer housewrap or commercial wrap. Refer to Division 07 Section "Weather Barriers."

2. One layer Grade D paper, or 15-lb felt.
- B. Weep Products: Use the following unless otherwise indicated:
1. Metal Weep Screed: Galvanized or stainless steel, of type recommended by manufacturer.
- C. Fasteners: Corrosion-resistant, self-drilling, type S-12 pancake head Super Tite Screws, manufactured by USG or other approved manufacturer, of sufficient length to penetrate into metal framing 3/8 inch. Select fasteners approved by stone product manufacturer.

2.3 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.4 FABRICATION

- A. Split-face stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
1. Shape stone specified to be laid in pattern matching existing installation.
- B. Gage backs of stones for adhered veneer if more than 81 sq. in. in area.
- C. Thickness of Stone: Provide thickness indicated, but not less than the following:
1. Thickness: As shown on Drawings, nominally 2 inches plus or minus 1/4 inch.
- D. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples.
1. Finish: Split face, or to match existing panels.

2.5 MORTAR MIXES

- A. General: Do not use admixtures unless otherwise indicated.
1. Do not use calcium chloride.
 2. Use portland cement-lime mortar unless otherwise indicated.
 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
1. Mortar for Setting Stone: Type S.

2. Mortar for Pointing Stone: Type S.
- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- D. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
 1. For latex-modified, portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- E. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.
 1. Scratch Coat Thickness: 1/2 inch, nominal minimum.

PART 3 - EXECUTION

3.1 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 1. Use hammer and chisel to split stone that is fabricated with split surfaces.
 2. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- D. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 3/8 inch at narrowest points or more than 1/2 inch at widest points.
- E. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- F. Place weep holes in joints where moisture may accumulate, including above shelf angles and at flashing.
 1. Use metal drip screeds to form weep holes.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

3.3 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install flashing over sheathing and behind weather-resistant sheathing paper by fastening through sheathing into framing.
- B. Install lath over weather-resistant sheathing paper by fastening through sheathing into framing to comply with ASTM C 1063.
- C. Install lath over plywood or OSB sheathing board attached to wood framing to comply with ASTM C 1063. Install screws at spacing recommended by veneer manufacturer, but at a rate equal to 1 fastener per square foot, and not to exceed spacing of 6 inches on center in one direction.
- D. Install scratch coat over metal lath 1/2 inch thick to comply with ASTM C 926. Allow to dry for 48 hours.
- E. Apply mortar for setting stone at rate of 1/2 to 3/4 inch thickness, covering not more than 10 square feet at one time.
- F. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.
- G. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides. At any interior installation, prepare joints for a dry-stack look. Tool joints before mortar has set.
- H. Do not allow mortar to set up on face of units; clean face of units as work progresses.

3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

- B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: Concave.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
 - 3. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.6 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION 044313

**SECTION 061000
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
 - 3. Wood furring.
 - 4. Plywood backing panels.
 - 5. Utility shelving.

1.2 SUBMITTALS

- A. Product Data: Data for fire-retardant treated materials.

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. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA C2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
 - 1. Use Interior Type A, only where indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
 - 1. Concealed Framing Other Than Non-Load-Bearing Interior Partitions: Douglas Fir-Larch, 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. Furring.
 - 4. Grounds.
- B. For items of dimension lumber size, provide No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - 1. Douglas Fir-Larch, No. 2 grade.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, 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.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Do not splice structural members between supports, unless otherwise indicated.
- E. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. Kerf back of concealed board nailers and blocking to prevent warping and cupping.
 - 1. Provide 3/8 - inch deep, single-blade-width kerf cuts for each size board as follows:
 - a. 2x4: two.
 - b. 2x6, 2x8: three.
 - c. 2x10, 2x12: four.

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.

END OF SECTION 061000

**SECTION 061063
EXTERIOR CARPENTRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Exposed heavy timber posts and framing beams.
 2. Screening fences.
 3. Fiber-cement wall panels
 4. Fiber-cement trim boards.

1.2 SUBMITTALS

- A. Product Data: For preservative treated wood products, plastic decking and metal framing anchors.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated
1. Factory mark each item with grade stamp of grading agency.
 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 TIMBER

- A. Maximum Moisture Content: 19 percent.
- B. Dressing: Provide dressed timber (S4S) unless otherwise indicated.
- C. Timber Posts: Douglas fir (North), Douglas fir (South), No. 1, NeLMA, NLGA, SPIB, WCLIB, or WWPA.
1. Porch Posts Supporting Roof: 8 by 8 inches, nominal, or as noted.
 2. Screening Fence Posts: 4 by 4 inches, nominal, or as noted.
- D. Fence Boards: Douglas fir (North), Douglas fir (South), No. 1, NeLMA, NLGA, SPIB, WCLIB, or WWPA.

1. Boards: 1 by 6 inches, nominal, or as noted.
2. Top Cap: 2 by 6 inches, nominal.

2.3 FIBER CEMENT PANELS AND BOARDS

A. Panel Products: James Hardie, "HardiPanel Vertical Siding. – Sierra 8."

1. Thickness: 0.312 inch.
2. Dimensions: 96 inches high by 48 inches wide.
3. Primed.

B. Trim Boards: James Hardie, "Hardie Trim Boards; 5/4 Rustic."

1. Thickness: 1 inch.
2. Dimensions: 5.5 inches.
3. Dimensions: 7.25 inches.
4. Dimensions (Eaves): 9.25 inches.
5. Primed.

C. Soffit Boards: James Hardie, "Hardie Soffit Panel; Vented Cedarmill."

1. Thickness: 0.25 inch.
2. Dimensions: 96 inches by 24 inches.
3. Primed

2.4 PRESERVATIVE TREATMENT

A. Pressure treat boards and dimension lumber which is used as sub-framing and which will not be stained, with waterborne preservative according to AWPA C2.

B. Preservative Chemicals: Acceptable to authorities having jurisdiction.

1. Do not use chemicals containing arsenic or chromium.

C. Use process that includes water-repellent treatment.

D. Use process that does not include water repellents or other substances that might interfere with application of indicated finishes.

E. After treatment, redry boards, dimension lumber and timber to 19 percent maximum moisture content.

F. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

1. For items indicated to receive a stained or natural finish, mark each piece on surface that will not be exposed or omit marking and provide certificates of treatment compliance issued by inspection agency.

G. Application: Treat items indicated on Drawings and the following:

1. Framing members less than 18 inches above grade.
2. Members in contact with masonry or concrete.
3. Posts.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel or fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
2. For plastic, use stainless-steel fasteners where fasteners are exposed to view.
3. For cement-fiber products, use fasteners recommended by panel manufacturers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set exterior rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit exterior rough carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Install metal framing anchors to comply with manufacturer's written instructions.
- C. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- D. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated on Drawings, complying with the following, if not indicated.:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 3. Table R602.3(1), "Fastener Schedule for Structural Members" and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

END OF SECTION 061063

**SECTION 061600
SHEATHING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Wood panel wall sheathing.
 2. Wood panel roof sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.3 WARRANTY

- A. Weather Resistant Sheathing Paper: Provide manufacturer's standard form of expressed warranty to cover cost of materials and labor to correct problems caused solely by the failure of building paper for a period of 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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."

2.2 MATERIALS

- A. Oriented Strand Board: DOC PS 2-10.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated. Thickness shall satisfy minimum and maximum requirements for referenced performance category.

- C. Factory mark panels to indicate compliance with applicable standard.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2.4 ROOF SHEATHING

- A. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.
 - 1. Thickness: 0.451 inch.

2.5 WALL SHEATHING

- A. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.
 - 1. Thickness: 0.451 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. 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.

3.2 WOOD PANEL SHEATHING INSTALLATION

- A. Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.

- B. Air and Moisture Barrier: Coordinate sheathing installation with flashing and joint sealant installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.
- C. Do not bridge expansion joints; allow joint spacing equal to spacing of structural supports.
- D. Install panels with laminated facer to exterior. Stagger end joints of adjacent panel runs.
- E. Attach sheathing panels securely to substrate with manufacturer-approved fasteners in compliance with the following:
 - 1. ICC-ES ESR-1539 or ICC-NES NER-272 for power-driven fasteners.
 - 2. IBC: Table 2304.9.1 Fastening Schedule.
 - 3. IRC: Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments."
- F. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
- G. Apply seam tape at all panel seams, penetrations, and facer defects or cracks to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-ES applicable to tape application.

END OF SECTION 061600

**SECTION 064023
INTERIOR WOODWORK**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Window stools.

- B. Related Sections include the following:
 - 1. Section 064116 "Plastic Laminated-Faced Architectural Cabinets."

1.2 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Samples for Verification:
 - 1. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: White maple, plain sawn or sliced.
- C. Wood Species for Opaque Finish: Any closed-grain hardwood.
- D. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- E. Lumber: DOC PS 20 and the following grading rules:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 - 2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 - 3. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

2.2 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

2.3 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE

- A. Grade: AWI, Custom.
- B. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N-grade wood moldings made to patterns included in WMMPA HWM 1.
 - 1. Species: Pine, birch, and clear softwood.
 - 2. Maximum Moisture Content: 9 to 12 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Matching: Selected for compatible grain and color.
 - 5. Provide the following standing and running trims in profiles listed in Finish Legend:
 - a. Base.
 - b. Window stools.
- C. Face Surface: Surfaced (smooth).
- D. 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.
- E. Fasteners for Interior Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

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. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims.

Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. 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 for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

END OF SECTION 064023

SECTION 064113
WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood-veneer-faced architectural cabinets.
 - 2. Cabinet hardware.
 - 3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

- B. Related Sections:
 - 1. Section 123623 "Plastic-Laminate Clad Countertops."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product high-pressure decorative laminate and cabinet hardware and accessories.

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

- C. Samples:
 - 1. Plastic laminates, for each color, pattern, and surface finish.
 - 2. Thermoset decorative panels, for each color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

- A. Do not obtain material required for fabrication until Architect has approved mockups, initial samples for selection, and samples for verification.

- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- D. Reveal Dimension: As indicated.
- E. Wood for Exposed Surfaces, Including door backs:
 - 1. Species: Red oak.
 - 2. Cut: Plain sliced/plain sawn.
 - 3. Grain Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
 - 4. Matching of Veneer Leaves: Slip match.
 - 5. Veneer Matching within Panel Face: Center-balance match.
- F. Semi-exposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.
 - 3. Drawer Bottoms: Hardwood plywood.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 2. Particleboard:
 - a. ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde
 - b. Grade M-2-Exterior Glue, for stone countertop substrates if indicated, at sinks and lavatories.

3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening.
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- F. Adjustable Shelf Standards and Supports:
 1. BHMA A156.9, B04071; with shelf rests, B04081
 2. BHMA A156.9, B04102; with shelf brackets, B04112.
- G. Shelf Rests: BHMA A156.9, B04013; [metal] [plastic] [metal, two-pin type with shelf hold-down clip].
- H. Drawer Slides: BHMA A156.9.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Aluminum,
 2. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 3. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
 4. Satin Stainless Steel: BHMA 630.
- K. Countertop Support Braces: Prefinished, stamped metal bracket leg, tapered leg, with 3 by 3 inch by 45-degree notch for cleat and wireway; Finish: black powder coat, unless otherwise indicated. For tops up to 25 inches deep: Minimum 400 pound capacity per pair:

1. A&M Hardware, Inc., "Work Station Brackets": 18 inches by 24 inches (LLV)
2. Doug Mockett & Co. "Large Basic Work Surface Support," Model SWS4. 18-1/4 inches by 24-1/4 inches (LLV).
3. TMI Systems: Model A7453. (Basis-of-Design).

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content. Where required, provide fire-retardant treated softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.6 SHOP FINISHING

- A. Transparent Finish:
 1. Grade: Custom.
 2. Finish: System - 11, catalyzed polyurethane.
 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 4. Staining: Match approved sample for color.
 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

END OF SECTION 064113

**SECTION 072100
INSULATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket insulation.
 - 2. Foam plastic board insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 DEFINITIONS

- 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 INSULATION PRODUCTS

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VI.
- B. Glass-Fiber-Blanket Insulation: ASTM C 665, Type I, unfaced.
- C. Glass-Fiber-Blanket Insulation: ASTM C 665, Type III, Class A, foil faced on one.
- D. Glass-Fiber-Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier) foil-scrim polyethylene.

2.2 GLASS-FIBER BLANKET INSULATION

- 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. CertainTeed Corporation.
 - 2. Guardian Building Products, Inc.

3. Johns Manville.
 4. Knauf Insulation.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- A. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.3 AUXILLIARY MATERIALS

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward exterior of construction or as indicated on Drawings.

3.3 APPLICATIONS

A. Extruded-Polystyrene Board Insulation:

1. Foundation insulation. 1 inch thick, or as noted on Drawings. Unfaced.

B. Exterior Stud Walls (Thermal Insulation): Batt type.

1. R-Value: 19 minimum
2. Thickness: Nominal 6-inch thickness, depending on manufacturer.
3. Vapor Retarder: FSK-25 facing.

C. Ceiling/Roof (Thermal Insulation): Batt type.

1. R-Value: 30.
2. Thickness: Minimum 9 inches, depending on manufacturer.
3. Vapor Retarder: FSK-25 facing.

D. Interior Walls (Acoustic Insulation): Acoustical batt or blanket type.

1. Thickness: Minimum 3 inches.
2. Facing: None.

END OF SECTION 072100

**SECTION 072500
WEATHER BARRIERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wrap.
 - 2. Flexible flashing.
 - 3. Sill sealer.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for sheathing joint and penetration treatment.
- C. Applications:
 - 1. Beneath polymer-based exterior insulation and finish system (EIFS).
 - 2. Beneath brick veneer.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 - PRODUCTS

2.1 SHEET WEATHER BARRIER

- A. Building Wrap: ASTM E 1677, Type I air and moisture barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 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. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
 - b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap D.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.
 - 1. Available Products: DuPont (E. I. du Pont de Nemours and Company); Tyvek Tape.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch 0.030 inch 0.040 inch.
- B. Available Products: DuPont (E. I. du Pont de Nemours and Company); DuPont FlexWrap.
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- D. Nails and Staples: ASTM F 1667.
- E. Fasteners for Building Wrap: 1-5/8 inch rust-resistant screw with 2-inch diameter plastic cap, or manufacturer approved 1-1/4 inch to 2 inch metal gasketed washer.
 - 1. DuPont (E. I. du Pont de Nemours and Company); Tyvek "WrapCaps."

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.
 - 3. Attach building wrap to sheathing using only screws with specified plastic caps or gasketed washers where building wrap will be exposed to elements for extended periods of time, or where installed over insulating foam substrate applied outside of sheathing board.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

SECTION 073113
ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Roof ventilation

B. Related Sections:

1. Section 061000 " Rough Carpentry" for wood framing.
2. Section 061600 "Sheathing" for roof-deck wood structural panels and roof sheathing.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings counterflashings and flashings.

1.2 DEFINITION

- A. Roofing Terminology: See 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of asphalt shingle ridge and hip cap shingles indicated.
1. Include similar Samples of trim and accessories involving color selection.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

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. Source Limitations: Obtain ridge and hip cap shingles, and self-adhering sheet underlayment from single source from single manufacturer.
- C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for asphalt shingles including related roofing materials.
 - a. Size: 48 inches long by 48 inches wide.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.

1.7 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.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is

operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.9 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
2. Material Warranty Period: 20 years from date of Substantial Completion.
3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 70 mph for five years from date of Substantial Completion.
4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 10 years from date of Substantial Completion.
5. Workmanship Warranty Period: 10 years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Fiberglass Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing, complying with requirement of ASTM D 3161 for wind resistance.

1. Available Products:
 - a. GAF Materials Corporation, "Timberline HD,"
 - b. TAMKO, "Heritage."
2. Style: Shake.
3. Strip Size: Manufacturer's standard.
4. Exposure: 5 or 5-5/8 inch to match existing shingle.

5. Color and Blends: "Weathered Wood," or to match existing shingle.
6. Algae Resistance: Granules treated to resist algae discoloration.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D 1970, minimum of 60-mil- thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied. Provide primer for adjoining masonry surfaces to receive underlayment.

1. Basis-of-Design Product: Subject to compliance with requirements, provide GAF Materials Corporation "WeatherWatch Leak Barrier, or other or comparable product by one of the following:
 - a. ALCO-NVC Inc.
 - b. Atlas Roofing Corporation.
 - c. Carlisle Coatings & Waterproofing, Inc.
 - d. Henry Company.
 - e. IKO.
 - f. Johns Manville.
 - g. Owens Corning.

2.3 VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with external deflector baffles; for use under ridge shingles.

1. Available Products:
 - a. GAF Materials Corporation "Cobra® Ridge Runner" ridge vent.
 - b. TAMKO, "Roll Vent Ridge Vent."
2. Minimum Net Free Area: 20 square inches per linear foot (NFVA).
3. Width: 11 inches.
4. Thickness: 1 inch.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, smooth shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 1. Sheet Metal: Zinc-tin alloy-coated steel.
- 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 the 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 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of chimney and 6 inches above the roof plane.
 4. 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: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

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.
 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below or as otherwise indicated on Drawings, lapped 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. Eaves: Extend from edges of eaves 36 inches beyond interior face of exterior wall.
 - 2. Rakes: Extend from edges of rake 36 inches beyond interior face of exterior wall.
 - 3. Valleys: Extend from lowest to highest point 18 inches on each side.
 - 4. Ridges: Extend 36 inches on each side.
 - 5. Sidewalls: Extend beyond sidewall 18 inches and return vertically against sidewall not less than 4 inches.

- C. Concealed, Valley Lining: Comply with NRCA's recommendations.
 - 1. Install a 36-inch- wide strip of granular-surfaced valley lining centered in valley, with granular-surface face up. Lap ends of strips at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck with roofing nails.

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

- C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

- D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

- E. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

- F. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

- G. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

- A. General: 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. Vent Installation: Install ridge and in-deck vents where indicated or as required to comply with requirements. Cut sheathing for installation of ridge and in-deck vents to required width, or lay sheathing with required gap width when installing. Do not extend ridge or in-deck vents to the edge of the roof unless indicated on Drawings, or as directed by Architect; terminate ridge and in-deck vents to align with interior face of wall framing.
- C. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed or at least 7 inches wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- D. 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.
- E. Fasten asphalt shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
 - 1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- F. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - 1. Do not nail asphalt shingles within 6 inches of valley center.
 - 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.
- G. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. 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 074633
PLASTIC SIDING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl siding.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For vinyl siding, include VSI's official certification logo printed on Product Data.
- B. Samples: For vinyl siding including related accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For vinyl siding Installer.
- B. Product certificates.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-certified Installer on Project.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VINYL SIDING

- A. Vinyl Siding: Integrally colored product complying with ASTM D 3679.
- B. Horizontal Pattern: 8-inch exposure in plain, single-board.
- C. Texture: Wood grain
- D. Nominal Thickness: 0.044 inch
- E. Nailing Hem: Double thickness.
- F. Finish: Woodgrain print with clear protective coating containing not less than 70 percent PVDF.
 - 1. Colors: As selected by Architect from manufacturer's full range of colors.

2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material and matching color and texture of adjacent siding unless otherwise indicated.
- B. Colors for Decorative Accessories: As selected by Architect from manufacturer's full range of colors.
- C. Flashing: Provide galvanized sheet metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- D. Fasteners:
 - 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
 - 2. For fastening vinyl, use aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install vinyl siding and related accessories according to ASTM D 4756.
 1. Install fasteners for horizontal vinyl siding no more than 16 inches o.c.
- C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074633

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Formed sheet metal fabrications.
 2. Wall penetration sheet metal flashings.
 3. Roof penetration sheet metals flashings.

1.2 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual".
- B. Preinstallation Conference: Conduct conference at Project site.

1.3 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 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. 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. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 2. Surface: Mill phosphatized for field painting.

2.2 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 or manufactured item unless otherwise indicated.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Fasteners for Metallic-Coated Steel Sheet: Hot-dip galvanized steel or Series 300 stainless steel.
 - d. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder: 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. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. 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. Obtain field measurements for accurate fit before shop fabrication.
 - 2. 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.
 - 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- C. 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.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

- E. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.4 ROOF SHEET METAL FABRICATIONS

- A. Counterflashing: Fabricate from the following materials:
 - 1. Coil-Coated Galvanized Steel: 0.028 inch (24 gauge) thick.
 - 2. Coil-Coated Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (24 gauge) thick.
- B. Flashing Receivers: Fabricate from the following materials:
 - 1. Coil-Coated Galvanized Steel or Galvanized Steel: 0.028 inch (24 gauge) thick.
 - 2. Coil-Coated Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (24 ga.) thick.
- C. Wall Penetration Flashing: Fabricate from the following materials:
 - 1. Coil-Coated Galvanized Steel or Galvanized Steel: 0.028 inch (24 gauge) thick.
 - 2. Coil-Coated Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (24 ga.) thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Coil-Coated Galvanized Steel or Galvanized Steel: 0.028 inch (24 gauge) thick.
 - 2. Coil-Coated Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (24 gauge) thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with cited sheet metal standards. Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanently watertight and weatherproof; conceal fasteners where possible.
 - 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. Install sealant tape where indicated.
 - 6. Torch cutting of sheet metal flashing and trim is not permitted.

- 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 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 wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- 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 sheet.
 - 2. 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.
- G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.2 ROOF FLASHING INSTALLATION

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.
- C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.3 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- D. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- E. Clean off excess sealants.
- F. 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 079200
JOINT SEALANTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section describes interior and exterior elastomeric sealants and installation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

1.5 WARRANTY

- A. Special Installer's Warranty: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: 10 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 EXTERIOR JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Colors: Selected by Architect from manufacturer's full range.
- C. Sealants for Exterior Uses in in Horizontal Traffic Surfaces:
 - 1. Urethane Joint Sealant ASTM C920, single (S) or multi-component (M) pourable (P) or nonsag (NS), traffic grade (T), Class 25 or Class 50.
 - 2. Manufacturers:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Pecora Corporation.
 - d. Sika Corporation; Construction Products Division.
 - e. Tremco Incorporated.
- D. Sealants for Exterior Uses in Vertical Joints:
 - 1. Neutral-Curing Silicone Joint Sealant ASTM C920; Single-Component (S), Nonsag (NS).
 - 2. Specific Joint Conditions:
 - a. Joints around and between aluminum storefront window components.
 - b. Expansion and control joints in masonry, and metal panels except as noted below for permanently concealed joints.
 - c. Expansion and control joints in EIFS.
 - d. Provide not less than medium modulus sealants at joints to a height of not less than 7 feet-0 inches (84 inches) above adjacent walking surfaces, or to the first logical transition location. Sealants above this height may be low-modulus.
 - 3. Manufacturers, General Use:
 - a. BASF Building Systems.
 - b. Dow Corning Corporation; 798.
 - c. GE Advanced Materials - Silicones.
 - d. Pecora Corporation; 890
 - e. Sika Corporation; Construction Products Division.
 - f. Tremco Incorporated; Spectrem 1.

- E. Sealants for Exterior Uses in Concealed Locations:
 - 1. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.
 - 2. Specific Joint Conditions:
 - a. Threshold bedding.
 - b. Factory-applied in roofing panel interlocking joints.
 - 3. Products:
 - a. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.
 - c. Tremco Incorporated; Tremco Butyl Sealant; JS733 Non-Curing Butyl Sealant.

2.2 INTERIOR JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Colors: Selected by Architect from manufacturer's full range.
- C. Sealants for Interior Horizontal Traffic Joints:
 - 1. Urethane, ASTM C 920, Single (S) or multi-component (M) urethane, Pourable (P); traffic grade (T), Class 25.
 - 2. Specific Joint Conditions:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - 3. Manufacturers:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Pecora Corporation.
 - d. Sika Corporation; Construction Products Division.
 - e. Tremco Incorporated.
- D. Sealants for Interior Uses at Vertical Surfaces and Horizontal Non-Traffic Surfaces:
 - 1. Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - a. BASF Building Systems, Sonolac.
 - b. Bostik, Inc; Chem-Calk 600.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.

- E. Sealant for Use in Interior Joints in Wet Locations:
 - 1. Specific Joint Conditions:
 - a. Ceramic Tile and Other Hard Surfaces in kitchens and toilet rooms.
 - b. Around Plumbing Fixtures in kitchens and toilet rooms:
 - 2. Single-component, mildew-resistant silicone sealant, ASTM C 920, Type S; Grade NS; Class 25; for Use NT; formulated with fungicide.
 - a. BASF Building Systems; Omniplus.
 - b. Dow Corning Corporation; 786 Mildew Resistant.
 - c. GE Advanced Materials - Silicones; Sanitary SCS1700.
 - d. Pecora Corporation.
 - e. Sika Corporation; Construction Products Division.
 - f. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 JOINT SEALANT BACKING

- A. General: Nonstaining; 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. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer. Provide self-adhesive tape where applicable.
- D. 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.
- E. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- F. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove 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), oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Remove laitance and form-release agents from concrete.
 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193.
- B. Install sealant backings to support sealants during application and to produce cross-sectional shapes and depths of installed sealants that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements stated below to form smooth, uniform beads of configuration indicated; to eliminate air pockets. Ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Provide concave joint profile unless otherwise indicated.
- E. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses .

END OF SECTION 079200

SECTION 081416
WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces, for opaque finish.
2. Hollow-core doors with wood-veneer, hardboard or MDF faces, factory-primed for field-applied opaque finish.
3. Factory finishing flush wood doors.
4. Factory fitting and pre-hanging flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Section 088000 "Glazing" for glass view panels in wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door indicated. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples: For factory-finished doors.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or other manufacturer with prior approval from Architect:
1. Algoma Hardwoods, Inc.
 2. Eggers Industries.
 3. Marshfield Door Systems, Inc.
 4. Oshkosh Architectural Door Company.
 5. Vancouver Door Company.
 6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde resin.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 3. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- B. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
- C. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. 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.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
- D. Hollow-Core Doors:

2.3 VENEERED-FACED DOORS FOR OPAQUE FINISH

- A. Exterior Solid-Core Doors:
1. Grade: Custom (Grade A faces or better).
 2. Face: MDF, poplar, or birch veneers.
 3. Thickness: 1-3/4 inches.

4. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Solid wood stiles and top and bottom rails.
5. Prehang doors in solid wood frames.
6. Prepare doors for installation of hardware.

B. Interior Hollow-Core Doors:

1. Grade: Custom (Grade A faces or better).
1. Face: MDF, poplar, or birch veneers.
2. Thickness: 1-3/4 inches.
3. Construction: Standard hollow core, solid wood stiles and top and bottom rails.
4. Prehang doors in solid wood frames.
5. Prepare doors for installation of hardware.

2.4 LIGHT FRAMES

- A. Provide view light frames of sizes and in locations shown on Drawings.
- B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
1. Wood Species: Same species as door faces.
 2. Profile: Flush rectangular beads.

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.
- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123" Interior Painting."

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Opaque Painted Finish: Grade: Custom.
1. Finish: One coat factory- or shop-applied primer, one intermediate coat, and one finish coats.
 2. Basis-of-Design MPI System: INT 6.4R Latex satin finish (over latex primer).
 3. Color: Refer to Material Schedules for Levels 1, 2 and 3 Finishes and for other spaces on Sheets G-1.7 and G1.8.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Field-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

**SECTION 085313
VINYL WINDOWS**

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Product Data: For each type of product.
 - 2. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
 - 3. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

- B. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period for the following warranty periods.
 - 1. Window: 10 years from date of Substantial Completion.
 - 2. Glazing Units: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.

- B. Performance Standards:
 - 1. Minimum Performance Class: R.
 - 2. Minimum Performance Grade: 15.
 - 3. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.35 Btu/sq. ft. x h x deg F.

2.2 VINYL WINDOWS

- A. Operating Types: Single hung.

- B. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Finish: Integral color, Color selected by Owner from manufacturer's full range.
 - 2. Gypsum Board Returns: Provide at interior face of frame.

- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered where indicated on Drawings or required by codes and authorities having jurisdiction.

- D. Insulating-Glass Units: ASTM E 2190.
 - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Kind: Fully tempered, where indicated on Drawings or required by codes and authorities having jurisdiction.
 - b. Tint: clear.
 - 2. Lites: Two.
 - 3. Filling: Fill space between glass lites with dehydrated air.
 - 4. Low-E Coating: Pyrolytic on second surface.
- E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- F. Hardware, General: Manufacturer's standard corrosion-resistant material sized to accommodate sash weight and dimensions. Exposed hardware color and finish selected by Owner from manufacturer's full range.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

- A. Muntin/Mullion Bars: Pattern as indicated on Drawings. Vinyl

2.4 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze vinyl windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Provide mullions and cover plates, 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. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.
- E. Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

- 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085313

SSECTION 088000
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. 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. GANA Publications: GANA's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.4 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. .S

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength:
 1. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.2 INSULATING-GLASS TYPES

- A. Glass Type: Low-e-coated, clear insulating glass.
 1. Overall Unit Thickness: 1 inch.
 2. Thickness of Each Glass Lite: 6.0 mm.
 3. Outdoor Lite: Bronze tinted float glass.
 4. Interspace Content: Air.
 5. Indoor Lite: Clear float glass.
 6. Low-E Coating: Sputtered on second surface.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal.

2.4 GLAZING SEALANTS

- A. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. 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 testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Install gaskets so they protrude past face of glazing stops.

3.3 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers

and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.4 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations.
- C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

SECTION 088300
MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Glazing Publications: Comply with GANA's "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

- A. Glass Mirrors, General: ASTM C 1503.
- B. Clear Glass: Mirror Select Quality. Kind FT (Fully Tempered).
 - 1. Thickness: 6.4 mm (1/4 inch).
 - 2. Provide safety glazing labeling where required to install safety glazing.
 - 3. Provide polished edges where indicated.
 - 4. Provide sealed edges for mirrors installed in bathrooms.

2.2 MISCELLANEOUS MATERIALS

- A. Edge Sealer: Approved by mirror manufacturer.
- B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors.

2.3 MIRROR HARDWARE

- A. Top Aluminum J-Channels and Bottom Aluminum L-Support: 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. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide devices as required for mirror hardware installation.

2.4 FABRICATION

- A. 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.
- B. Mirror Edge Treatment: Grind smooth edges which will be exposed and which are not concealed in edge framing or channel so that there are no sharp edges or protrusions. Seal edges of mirrors with edge sealer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.
- B. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.
- C. 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.
- D. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors. 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.
- E. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- F. Do not permit edges of mirrors to be exposed to standing water.
- G. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- H. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

**SECTION 092900
GYPSUM BOARD**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.

- B. Related Sections:
 - 1. Section 072100 "Thermal Insulation" for thermal and acoustic insulation installed in assemblies that incorporate gypsum board.
 - 2. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.3 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.

1.4 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.

- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- 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. American Gypsum.
 2. CertainTeed Corp.
 3. Georgia-Pacific Gypsum LLC.
 4. Lafarge North America Inc.
 5. National Gypsum Company.
 6. Temple-Inland.
 7. USG Corporation.
- B. Gypsum Board: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch
 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 1. Thickness: 1/2 inch.
 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 1. Core: 5/8 inch.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 4. Rated for wall and ceiling installations.

2.2 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 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. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

2. Core: 5/8 inch (15.9 mm), Type MR or XP, depending on manufacturer.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - 1) 90-degree: Equal to USG B1W, or if required B1XW EL (Extra Wide)
 - 2) 135-degree: Equal to USG B1 OS.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound. Equal to USG B9.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound. Equal to USG B4 Series.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint. Equal to USG No. 093, single-piece B-shaped control joint and keyed metal flanges with removable tape.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Board: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.5 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
- D. Thermal and Acoustic Insulation: As specified in Section 072100 "Thermal Insulation."

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. Before installing sound attenuation or thermal insulations blankets, if any, and closing wall with first layer of gypsum board on second side of wall or partition, clean out all dust and debris from floor track and vacuum thoroughly.
- C. 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.
- D. 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.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these

locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 - 1. Control Joints: Install control joints at locations indicated on Drawings.
- I. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- J. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- K. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - b. Walls and ceilings scheduled to receive flat or eggshell paint finish.
 - c. Primer and its application to surfaces are specified in other Division 09 Sections.
 - d. Walls scheduled to receive flat or eggshell paint finish.
- L. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- M. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- N. Remove and replace panels that are wet, moisture damaged, and mold damaged.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Moisture- and Mold-Resistant Type: All vertical surfaces, unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces, as indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At high walls, install panels horizontally, unless otherwise indicated .
 - c. Apply in lengths sufficient to extend from floor to ceiling with no horizontal joints
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile. Areas behind cabinetry.

3. Level 3: Where indicated on Drawings Insert locations. Surfaces indicated to receive textured "knock-down" finish:
 - a. Living spaces scheduled to receive eggshell latex paint.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Bathroom ceilings scheduled to receive epoxy paint.

E. Finish Level Descriptions:

1. Level 1: Tape in joint compound at joints and interior angles. Tool marks and ridges acceptable.
2. Level 2: Level 1, plus separate coat of compound at joints, angles, fasteners, and accessories. Tool marks and ridges acceptable.
3. Level 3: Level 1, plus two separate coats of compound at joints, angles, fasteners and accessories. Tool marks and ridges are not acceptable; surface shall be smooth and free of tool marks and ridges.
4. Level 4: Level 1, plus three separate coats of compound at joints, angles, fasteners and accessories. Compound shall be smooth and free of tool marks and ridges.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

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
TILING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior ceramic floor tile.
 - 2. Interior porcelain wall tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Related Sections:
 - 1. Section 092900 "Gypsum Board" for tile backing panel.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of wall tile installation.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. Interior Floor Tile:

1. Porcelain Tile
 - a. Products: Refer to Room Finish Legend and Room Finish Schedule.
 - b. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - c. Joint Width (Restrooms): 1/16 inch.

C. Interior Wall Tile:

1. Porcelain Tile:
 - a. Products: Refer to Room Finish Legend and Room Finish Schedule.
 - b. Joint Width (Restrooms): 1/16 inch.
 - c. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - d. External Corners for Thin-Set Mortar Installations: Bullnose shape, same size as adjoining flat tile.

2.2 CRACK ISOLATION

- A. General: Manufacturer's standard product, selected from the following which comply with ANSI standards for performance and is/are recommended by the manufacturer for the application indicated. Provide product selected by Architect, or product which best meets conditions of the project.
- B. Fluid-Applied Liquid Waterproofing and Crack Suppression: ANSI A108.01, A108.17, A108.13, A118.10 and A118.12.
 1. Manufacturer: Custom Building Products.
 2. Product: "RedGard Waterproofing and Crack Prevention Membrane."
 3. Limitations: Suitable for isolating cracks up to 1/8 inch wide. Cracks exceeding 1/8" (3 mm) should be treated in accordance with TCNA F125 or TCNA F125A.
 4. Applicable TCNA Methods: EJ171, F125 and F125A.
 5. When used as a vapor barrier, apply one full coat (70 sq. ft. per gallon) where vapor transmission is up to 8 lbs. per 1000 sq. ft. per day and two full coats (70 sq. ft. per gallon each coat) where vapor transmission is up to 12 lbs. per 1000 sq. ft. per day.

2.3 TILE BACKING PANELS

- A. Interior: Fiberglass-Mesh Reinforced Cement Backerboard. ANSI A118.1.
 1. Manufacturer: Custom Building Products.
 2. Product: WonderBoard Lite Backerboard.
 3. Panel Size: 36 by 60 inches by 7/16-inch thickness.

4. Installation:
 - a. Required Joint Width: 1/8 to 3/16 inch between all panel edges.
 - b. Prefill all joints and corners with polymer-modified mortar, and bed 2 inch wide mesh tape and smooth over with joints and corners.

2.4 SETTING MATERIALS

- A. Modified Dry-Set Portland Cement Mortar: ANSI A118.1.
 1. Manufacturer: Custom Building Products.
 2. Product: "MegaLite Ultimate Crack Prevention Large Format Tile Mortar." Non-slip, non-slump medium bed for heavy wall and floor tile.
- B. Organic Adhesive: Not permitted.

2.5 GROUT MATERIALS

- A. Interior:
 1. Polymer-Modified Tile Grout: ANSI A118.7.
 - a. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
 - b. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
- 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 and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- C. Remove all grease, oil, dirt, curing compounds, sealers, adhesives or any other contaminant that would prevent good bond. Concrete must cured at least 28 days and accept water penetration, and be free of efflorescence and not subject to hydrostatic pressure. Concrete slabs should have a coarse finish to enhance bond.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors composed of tiles 12 by 12 inches or larger.
 - b. Tile floors composed of rib-backed tiles.
- B. 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.
- C. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

- E. Joint Widths: Refer to Article 2.1 above:
- F. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Metal Edge Strips: Install at locations indicated.
- H. Interior Wall Backer Units: Install backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Tile Installation, Cementitious Backer Board Substrate on Wood Studs.
 - 1. Tile Installation W245, latest edition, or similar: Thin-set mortar on cementitious backer board.
 - a. Thin-Set Mortar: Modified Dry-Set Portland Cement Mortar.
 - b. Grout: Depending on width of joint provide one of the following. Refer to Material Finish Legend and Room finish Schedule.
 - c. Polymer-modified unsanded grout.
- B. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F113: Thin-set mortar; TCA F113.
 - a. Thin-Set Mortar: Modified Dry-Set Portland Cement Mortar
 - b. Grout: Indicated by Finish Legend and Room Finish Schedule: Polymer-modified sanded grout.
 - 2. Installation F125A: Thin-set mortar on crack isolation membrane; TCA F125A.
 - a. Thin-Set Mortar: Modified Dry-Set Portland Cement Mortar
 - b. Grout: Polymer-modified unsanded grout.

END OF SECTION 093000

**SECTION 096519
RESILIENT TILE FLOORING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Luxury vinyl floor tile.
- B. Related Sections:
 - 1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor tile. 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.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings and in Finish Legend and Room Finish Schedules.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed, and return to Owner any full, unused tile from opened boxes.

1.6 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 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.9 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace resilient floor tile that does not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Vinyl Floor Tile: 10 years material defect warranty, 2 year limited labor warranty.

PART 2 - PRODUCTS

2.1 LUXURY VINYL FLOOR TILE

- A. Products: Subject to compliance with requirements, provide the products indicated in the Finish Legend and Room Finish Schedule.
 - 1. Wearing Surface: Smooth.
 - 2. Thickness: By manufacturer's specification for product indicated in Finish Legend.
 - 3. Size: By manufacturer's specification for product indicated in Finish Legend.
 - 4. Colors and Patterns: As indicated by manufacturer's designations for products listed in the Finish Legend.

2.2 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 for Luxury Vinyl Floor Tile: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Luxury Vinyl Floor Tile Adhesive: Not more than 50 g/L.
- C. Floor Polish: None required for according to manufacturer's recommendations.

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 and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
- 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. Do not use gypsum-based floor patching leveling compounds; use only portland-cement based patching and leveling compounds as recommended by tile manufacturer.
- 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.
 - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. 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.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 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 marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

**SECTION 097700
PLASTIC WALL PANELS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Fiberglass-reinforced plastic (FRP) wall panels.
 2. Trim accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate joints and termination points.
- C. Samples: Submit 2 samples, 8 by 10 inches, for verification of wall panel texture and color for selections indicated in this Section and the Finish Legend.
1. Manufacturer's Instructions: Manufacturer's installation instructions.

1.3 INFORMATIONAL SUBMITTALS

- A. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
- B. Warranty: Warranty documents specified herein.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall panels and trims to include in maintenance manuals.

1.5 MAINTENANCE MATERIALS SUBMITTALS

- A. Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 01 Closeout Submittals (Maintenance Materials) Section.
1. Quantity: Furnish quantity of FRP wall panels and trims equal to 5 percent of amount installed.
 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

1.6 QUALITY ASSURANCE

- A. Pre-installation Meetings: Conduct pre-installation meeting at Project site to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.
- B. Source Quality: Obtain fiberglass reinforced plastic (FRP) panels from a single manufacturer. Provide panels and molding only from manufacturer specified to ensure warranty and color harmonization of accessories.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to site.
- C. Storage and Protection: Store panels and accessories dry and indoors. Store material to protect from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- D. Handling: Remove foreign matter from face of panel by using a soft cloth or brush to avoid scratching or abrasions.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Installation shall not begin until building is fully enclosed, permanent heating and cooling equipment is in operation for a period of time sufficient to stabilize interior temperature and humidity.
 - 2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of.
 - 3. Provide ventilation to disperse fumes during application of adhesive as recommended by panel adhesive instructions.
- B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 FIBERGLASS-REINFORCED (FRP) WALL PANELS**

- A. General: Provide panels of each type of from same run or dye lot.
- B. Basis-of-Design Manufacturer: Koroseal, or other manufacturer of comparable products approved by the Architect not less than 5 days prior to bidding.
- C. Panels:
 - 1. Pre-finished fiberglass-reinforced wall panels.
 - 2. Surface Texture: Manufacturer's standard for this product.
 - 3. Color: Indicated in Room Finish Legend, Sheet A600
 - 4. Size: As indicated in Finish Legend, or 4 by 8 foot sheets.

2.2 ACCESSORIES

- A. Trims: Extruded integral color PVC Trim for 0.090-inch-thick panels. Provide trims by the Basis-of-Design manufacturer listed or comparable trims of another approved manufacturer as applicable to conditions.
 - 1. M082 J-Molding.
 - 2. JC12 Aluminum J-Molding.
 - 3. M083 Inside Corner Molding.
 - 4. IC12 Aluminum Inside Corner Molding.
 - 5. M085 Outside Corner Molding.
 - 6. OC12 Aluminum Outside Corner Molding.
 - 7. M087 Divider Bar.
 - 8. M088 Divider Bar.
 - 9. DB12 Aluminum Divider Bar.
 - 10. C100 Color-Matched Caulk.
 - 11. R333 Heavy Pressure Roller.
- B. Adhesives and Sealants: Water-resistant, non-flammable adhesive meeting requirements of ASTM C 557, manufactured by FRP panel manufacturer, or other compatible adhesive approved by him that will not void warranty.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Upon receipt, inspect all packaging and materials for damage
- B. Before installation, open cartons and carefully inspect all panels and accessories.
- C. Before beginning installation, inspection project conditions. Commence installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Panels should be opened and allowed to acclimate for 48 hours prior to installation. The building shall be closed with HVAC operational and conditioned to final use ambient humidity and temperature. Room temperature should be approximately 65° F or above before beginning installation.
- B. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

3.3 INSTALLATION

- A. Install all FRP products and accessories in strict accordance with the manufacturer's installation instructions, using manufacturer-supplied or approved adhesives and sealants.
- B. All moldings must provide for a minimum 1/8 inch of panel expansion at joints and edges, to insure proper installation.

3.4 MAINTENANCE

- A. Wipe down using a damp cloth and mild soap solution or cleaner. Refer to manufacturer's specific cleaning recommendations.

END OF SECTION 097700

**SECTION 099113
EXTERIOR PAINTING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Exterior wood trim, including primed cement board products.
- B. Related Sections include the following:
 - 1. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches 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.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.3 QUALITY ASSURANCE

- A. MPI 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. 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 specified in Part 3.

2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 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.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints 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.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. ICI Paints.
 3. Porter Paints.
 4. PPG Architectural Finishes, Inc.
 5. Sherwin-Williams Company (The).

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 in a color schedule.

2.3 EXTERIOR LATEX PAINTS

A. Exterior Latex, Products:

1. Finish Coats: Semigloss Latex Paint.
 - a. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: MDF per coat: 1.5 mils (0.038 mm).
 - b. Sherwin-Williams; A-100 Latex Gloss A8 Series: MDF per coat: 1.3 mils (0.033 mm).

2.4 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Paints, Products:

1. Finish Coats: Semi-Gloss Alkyd Enamel Paint.
 - a. Benjamin Moore; M24 D.T.M. Alkyd Semi-Gloss; MDF per coat: 2.0 mils (0.05 mm).
 - b. Sherwin-Williams; B55 series, Direct-to-Metal Enamel (alkyd enamel); MDF per coat: 3.0 to 5.0 mils (0.07 to 0.013 mm)

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.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. 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 and paint systems 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.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Wood Trim, including primed cement fiber board trim: Two finish coats over a primer. Primer may be omitted if material is preprimed.
 - 1. Primer: Exterior Wood Primer for Acrylic Enamel Paints.
 - a. Pittsburgh Paints; 6-609 SpeedHide Exterior House & Trim Wood Primer 100 Percent Acrylic Latex: MDF 1.6 mils (0.041 mm).
 - b. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W41: MDF 1.4 mils (0.036 mm).
 - 2. Finish Coats: Exterior Semigloss Acrylic Paint.
 - a. Pittsburgh Paints: 6-9 Series SpeedHide Exterior Paint: MDF 1.5 mils (0.038 mm) per coat.
 - b. Sherwin-Williams: A-100 Latex Gloss A8 Series: MDF: 13 mils (0.033 mm) per coat.

END OF SECTION 099113

SECTION 099123
INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum board.
- B. Related Sections include the following:
 - 1. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches 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.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
- D. Coating Maintenance Manual:
 - 1. Upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

1.3 QUALITY ASSURANCE

- A. MPI 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. 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 specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 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.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Sherwin-Williams Co. (Basis-of-Design).
 2. Porter Paints.
 3. PPG Architectural Finishes, Inc.
 4. Pratt and Lambert.
 5. Benjamin Moore & Co.

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 in the Finish Legend and Room Finish Schedule.
- C. To the greatest extent possible, select low-odor and/or low-VOC products.

2.3 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107
- B. Primer, Galvanized, Water Based: MPI #134

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50 Gypsum board
- B. Primer, Latex: MPI #39 Interior Wood

2.5 WATER-BASED PAINTS

- A. Latex, Interior, Flat, (Gloss Level 1): MPI #53 Gypsum board ceilings

- | | | | |
|----|--|---------------|---------------------------------|
| B. | Latex, Interior, Eggshell (Gloss Level 3): | MPI #52 | Gypsum board walls |
| C. | Latex, Interior, Semi-Gloss, (Gloss Level 5): | MPI #54 | Gypsum board walls and ceilings |
| D. | Latex Enamel, Semi-Gloss. (Gloss Level 5)
(Latex, Interior, High-Performance Architectural) | MPI #141 | Wood base, wood doors and trim |
| E. | Chalkboard Paint, Chalkboard Finish | DuPont Krylon | Gypsum board wall |

2.6 SOLVENT-BASED PAINTS

- A. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81

2.7 THINNER AND CLEANUP

- A. Low-Odor Alkyd Paint Thinner and Cleanup:
1. Pittsburgh Paints: Odorless Thinner; 21-300 Line

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.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. 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. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. 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.

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. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.

- d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
2. Electrical Work:
- a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

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 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 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 102800
TOILET AND BATH ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes toilet and bath accessory products furnished and supplied by Contractor.

1.2 ACTION SUBMITTALS

- A. Product Data and Schedule: For each type of product indicated. Identify locations using room designations indicated on Drawings, using designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 WASHROOM ACCESSORIES

- A. Refer to Specialties Schedule on the Drawings for manufacturers and products, to include:
 - 1. Grab bars (horizontal, vertical, and shower)
 - 2. Shower curtain rod.
 - 3. Towel hook.
 - 4. Towel bar.
 - 5. Towel ring.
 - 6. Toilet tissue holder.
 - 7. Portable shower seat.

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.

3.2 ADJUSTING AND CLEANING

- A. 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 EXTINGUISHERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

- A. Extinguishers: Larsen's MP-5. 5-lb. ABC, dry chemical.
- B. 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. Larsen's, Model 1521.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fire extinguishers in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

END OF SECTION 104413

**SECTION 113100
RESIDENTIAL APPLIANCES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes kitchen equipment listed in the Specialty Schedule on the Drawings and as furnished and installed by Contractor.

PART 2 - PRODUCTS

2.1 KITCHEN APPLIANCES

- A. Contractor Provided/Contractor-Installed: Install the following appliances under the Contract. Refer also to Specialty Schedule on Drawings:
 - 1. Dryer
 - 2. Range and oven.
 - 3. Refrigerator.
 - 4. Washing machine.

2.2 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Provide all necessary plumbing supply and waste, and electrical services. Comply with plumbing and electrical wiring, connection, and control requirements.

2.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties.

5. Inform Owner of damaged equipment, and malfunctioning controls and components. Return damaged, malfunctioning, or inoperative items to Owner for replacement.

END OF SECTION 113100

SECTION 123623
PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. Standard-use plastic-laminate countertops..
- B. Related Sections:
 - 1. Section 064113 Wood-Veneer-Faced Architectural Cabinets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including high-pressure decorative laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
 - 1. Plastic laminates, for each color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications.
- B. Installer Qualifications.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops 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.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
- B. Grade: Custom or better.

- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or as indicated in the Finish Legend:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Panolam Industries International, Inc.
 - e. Wilsonart International; Div. of Premark International, Inc.
- D. Core Material at Sinks: medium-density fiberboard made with exterior glue or exterior-grade plywood.
- E. Core Thickness: Indicated on Drawings from one of the following:
 - 1. 3/4 inch for standard countertops. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top
- F. Paper Backing: Provide paper backing on underside of countertop substrate.
- G. Splashes: Provide 4-inch high splashes fabricated from same material as countertop substrate, not less than 1/2 inch thick, and complying with the following:
 - 1. Provide endsplashes or sidesplashes at countertops which die into walls, partitions, or taller millwork.
 - 2. Match material, color, and height of sidesplashes or endsplashes to backsplashes, and to material and color of countertop.
 - 3. Provide full-height backsplashes, end- and side-splashes where indicated on Drawings.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
 - 2. Softwood Plywood: DOC PS 1.

2.3 MISCELLANEOUS MATERIALS

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.

- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
- C. Complete fabrication, including assembly, 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.
- D. Shop cut openings to maximum extent possible to receive 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
 - 2. Fabricate tops to locate joints in tops as far from sinks as possible, but not less than 24 inches.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

END OF SECTION 123623

**SECTION 220000
PLUMBING SPECIFICATIONS**

Part 1 - THE GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS AND INSTRUCTIONS

TO BIDDERS Shall apply to and be PART of this specification.

- A. Contractor shall comply with all applicable codes, rules and regulations.
- B. Contractor shall obtain and pay for all permits, certificates of inspection and approvals required.

Part 2 - SCOPE OF WORK

- A. Water piping systems
- B. Soil, waste, and vent piping systems
- C. Gas piping (Not Used)
- D. Plumbing fixtures
- E. Plumbing equipment
- F. Painting and electrical work is not PART of this contract.

Part 3 - GENERAL STANDARDS

- A. The applicable provisions of the following standards shall govern:
- B. American society for test materials (ASTM);
- C. American standards association (ASA);
- D. Underwriters' laboratories (UL);
- E. National fire protection association (NFPA);
- F. State building code.
- G. The installation of all plumbing work shall conform to the applicable local plumbing codes and statues.

Part 4 - EXCAVATION AND BACKFILL

- A. Do all excavation and backfilling. Lay sewer and underground piping lines on 6" compacted sand. Backfill under building and all drives, roads and walks with bank-run gravel.

Part 5 - WATER PIPING SYSTEMS

- A. Domestic cold-water piping
- B. Domestic hot-water piping
- C. Trap primers for floor drains (Not Used)

Part 6 - INTERIOR WATER PIPING:

- A. Tube size 2" and smaller: *PEX* tube.
- B. Wall thickness: type I, hard-drawn temper.
- C. Fittings: *PEX*, solder-joints.
- D. Tube size 2-1/2" and larger: *PEX* tube.
- E. Wall thickness: type I, hard-drawn temper.
- F. Fittings: *PEX*, solder-joints.

Part 7 - WHERE ALLOWED BY CODES AND OWNER:

- A. Pex distribution system: ASTM f877, ASTM f1960, sdr 9 tubing.
- B. PEX tubing fitting tube shall be per ASTM f1960 and ASTM 2080, with metal-insert type with copper or stainless-steel crimp rings and matching pex tube dimensions.

- C. MANIFOLD: multiple-outlet, cooper assembly complying with ASTM f877, with brass or bronze full port ball valve for each outlet.
- D. PEX piping shall not be installed where is exposed to direct sunlight. No joints or unions shall be installed below the building slab.
- E. PEX tubing shall be insulated to maintain smoke and fire spread per ASTM e 84 when installed in return air plenum.
- F. Provide tubing with nominal inside diameter in accordance with ASTM f876.
- G. The domestic water piping system shall be flushed with clean potable water until contaminated water does not appear at the outlet and shall be filled with a solution containing fifty (50) PARTs per million of chlorine and allowed to stand as required by code before flushing. The system shall be flushed completely with clear water until all residual chlorine content is removed. Chlorination shall be performed after all piping and final connections and pressure testing has been completed.

Part 8 - TESTING

- A. Domestic cold water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gauge (before insulation applied) and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Soil, waste and vent piping shall be tested with water before installing plumbing fixtures.

Part 9 - SOIL, WASTE AND VENT/GAS PIPING SYSTEM

- A. Furnish and install a complete soil, waste and vent system in the building and on the site as indicated on the drawings and as specified herein. Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.
- B. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to *arobic system*.

Part 10 - INTERIOR PIPING:

- A. Pipe and fittings:
- B. Provide sch.40 pvc plastic piping with drainage pattern fittings and
- C. Solvent-cemented joints per ansi/ASTM d1789 & d2729.
- D. Piping alignment shall be as indicated on the drawings using approved y branches or eight bands for direction changes and shall be surely supported or secured to maintain such alignment.
- E. Pitch of piping shall be uniform at a minimum of 1/4" per foot for building drains and as indicated on the drawings for sewers.
- F. Protection shall be given all footings, other structural elements during underground work adjacent to such items. Refer to structural drawings.
- G. Vent all fixtures, connect branch vents to main vent risers at least three feet and six inches above vented fixtures. Pitch vent lines back to soil or waste pipe, free of drops and sags.
- H. Cleanouts shall be full size of pipe up to 4", and 4" for larger sizes. For underground and concealed lines, provide cleanouts in accessible positions at each right angle turn and at

intervals not to exceed fifty feet. In floors, install flush with finish floor with extension pipe from cleanout "y".

I. Hangers and support:

1. Furnish and install hangers, clamps, inserts, etc. Necessary for the installation of all pipes and equipment. Soil, waste and vent stacks shall be well supported at the base of the riser. Supports for copper pipes shall be placed on 8-foot centers. Support for vertical pipe shall be placed at top and bottom of each floor. Insulation shall run continuous through all hangers and supports.

Part 11 - FLOOR DRAINS

- A. The plumbing contractor shall provide and install trap primers for all floor drains. Trap primer shall be equal to PPP inc. Model "Oregon #1" trap primer valve.

Part 12 - PLUMBING FIXTURES

- A. Water closets.
- B. Lavatories.
- C. Service sinks.
- D. Water coolers.

Part 13 - PLUMBING EQUIPMENT

- A. Water heaters

Part 14 - ACCEPTABLE MANUFACTURERS

- A. Fixtures: water closet, urinals, lavatories, seats, flush valves, showers, service sinks, mop basins.
 1. Manufacturers: Kohler, American Standard, Zurn, Crane & Eljer, Olsonite, Beneke, Sloan, Delaney, Fiat, and Stern-Williams.
- B. Electric water coolers
 1. Manufacturers: Elkay, Halsey, and Haws.
- C. Stainless steel sinks (contractor furnished)
 1. Manufacturers: Elkay and Just.
- D. Fixtures: carriers
 1. Manufacturers: JAY R. SMITH, JOSAM, WADE, ZURN.
- E. Fixtures: hydrant & hose bibs
 1. Manufacturers: jay r. Smith, Chicago, Woodford, Zurn, Josam.

Part 15 - CATHODIC PROTECTION

- A. Provide dielectric insulation at points where copper or brass pipe comes in contact with ferrous piping, reinforcing steel or other dissimilar metal in structure.

Part 16 - SHOCK ABSORBERS

- A. Remove shock conditions from all piping. Provide and install shock absorbers on all piping serving flush valve fixtures.

Part 17 - VALVES

- A. Main shut off valves shall be installed as shown on the plans. Shut off valves shall be nibco s/t 580 ball valves or equal. Valves shall have blowout proof stem, the seats and brass ball. Pressure rating of all main valves shall have a rating of at least 400 psi working pressure.

- B. Valves shall be installed as shown on the plans. When valves are not shown in detail on the plans, the contractor shall furnish and install all valves necessary for the control operation and isolation of equipment. Pitch all pipe to low points and install drain valves.
- C. Gate valves or ball valves shall be used in services requiring the valves to be fully opened or tightly closed. Globe or angle valves shall be used where throttling or flow control is desired, or in by-pass lines. Globe and angle valves shall be equipped with the appropriate disc material for the intended service. Cold water globe valves shall have rubber disc; hot water shall have composition disc.
- D. This contractor shall furnish and install shut-off valves to isolate each fixtures, item or unit at the fixture items or unit whether furnished by this contractor or by others.
- E. Fixtures, item or units furnished by the manufacturer with integral stops or stops specified with the fixture are considered to be properly valved off at the fixtures.
- F. Access shall be provided to all valves.

Part 18 - PIPE JOINTS AND CONNECTION

- A. All cutting and patching of finished construction of building shall be performed by this contractor under the section of specifications covering these materials.
- B. Any minor adjustment in location of alignment of new work or to connect to existing utilities shall be performed as directed by the architect without additional cost to the owner.
- C. The contractor shall be responsible for damages to the grounds, walks, road, building, piping systems, electrical systems, and their equipment and contents, caused by leaks in the piping systems being installed or having been installed by him. He shall repair at his expense all damaged so caused. All repair work shall be done as directed by and in such manner as satisfactory to the architect.
- D. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the contractor's guarantee bond nor relieving the contractor of his responsibilities during the bonding period.

Part 19 - PIPE INSULATION (Only required in unconditioned & uninsulated locations)

- A. Fiberglass piping insulation: ASTM c 547, class 1 flexible closed cell elastomeric piping insulation: ASTM c 534, type i, (equal to armaflox).
- B. Encase pipe fittings insulation with one-piece pre-molded pvc fitting covers.
- C. Vapor barrier material: paper-backed aluminum foil, except as otherwise indicated, strength and permeability rating equivalent to adjoining pipe insulation jacketing.
- D. Staples, bands, wires, and cement: as recommended by insulation manufacturer for applications indicated.
- E. Adhesives, sealers, and protective finishes: as recommended by insulation manufacturer for applications indicated.
- F. Cover all cold water and condensate (if routed inside the building) piping with 1/2" thick flexible closed cell elastomeric insulation, having a "k" value of .25.
- G. Cover all hot water piping with 1" thick jacketed glass fiber preformed insulation with jacket sealed and taped, having a "k" value of .25.

H. Flexible closed cell elastomeric installation: slit tubular sections onto pipe. On areas where pipe end is open, slide full sections onto pipe. All edges shall be clean cut. Insulation shall be pushed onto pipe, never pulled. All seams and butt joints shall be adhered and sealed using adhesive equal to armafex 520 adhesive.

Part 20 - INTERRUPTION OF SERVICES

- A. When it is required to interrupt existing services, this contractor shall first notify the architect that an interruption is required. It should be noted that facilities must be kept in operation as much as possible.
- B. This contractor shall advise the architect of the length of time the service will be interrupted and shall get permission from the architect before proceeding with the work.

Part 21 - WARRANTY

- A. This contractor shall warrant that all work under this section shall be free of defective work, materials and PARTs for a period of one year after acceptance of the work and shall repair, revise, and replace, at no cost to the owner, any such defects occurring within the warranty period

END OF 220000

SECTION 230000
HEATING, VENTILATING, AND AIR CONDITIONING

Part 1 - GENERAL:

- A. General provisions of the contract including general and supplementary conditions and general requirements apply to work of this section.
- B. Scope:
 - 1. The base bid includes furnishing all materials, labor, tools, and equipment and the performance of all work required to install a complete heating and air conditioning system as outlined herein.
- C. Quality Assurance:
 - 1. Provide a complete installation in conformance with the following standards.
 - a. AGA American Gas Association
 - b. ASHREA American Society Of Heating, Refrigerating And Air Conditioning Engineers
 - c. NFPA National Fire Protection Association
 - d. SMACNA Sheet Metal And Air Conditioning Contractors National Association.
 - 2. Statewide Building Code
 - 3. IMC International mechanical code
- D. Work Not Included:
 - 1. the following work is not included under this contract:
 - a. -electric power wiring of motors
 - b. -starters and disconnect switches except as hereinafter specified
 - c. -field painting of equipment except as hereinafter specified
- E. Permits, Fees, Inspections, Laws, And Regulations:
 - 1. permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges. Laws and regulations, which bear upon or affect the various branches of this work shall be complied with by this contractor and are hereby made a part of this contract. All work, which such laws require to be inspected, shall be submitted to the proper public official for inspection and a certificate of final approval must be furnished.
- F. Work In Existing Spaces:
 - 1. General: care shall be taken when working in existing spaces so as not to damage existing walls and ceilings where work is being performed.
 - 2. Ceilings: where work is being performed above ceilings, and the architectural drawings do not indicate ceiling modifications by the general contractor, it shall be the responsibility of this contractor to remove and replace existing ceilings where work is being performed. In those instances, all repair and installation of new grid,

- ceiling panels, etc. shall be the responsibility of this contractor. Match existing finishes.
3. Walls & floors: it shall be the responsibility of this contractor to patch existing walls and floors and match existing finishes where work is being removed or installed and patching is being performed, unless noted otherwise on the architectural drawings.
- G. Tests and Adjustments:
1. No ducts, piping, fixtures or equipment shall be concealed or covered until they have been inspected and approved by the architect and the inspector who shall be notified by the contractor when the work is ready for inspection.
 2. Work shall be completely installed, tested and leak tight before inspection is required. All tests shall be repeated to the satisfaction of those making the inspection.

Part 2 - METAL DUCTWORK

- A. Ductwork Materials
1. Exposed ductwork materials: No Exposed ductwork
 2. Sheet metal: No sheet metal ductwork
- B. Miscellaneous Ductwork Materials
1. Volume dampers: integrated into diffusers.
 2. Fittings: provide radius type fittings fabricated of multiple sections with maximum 15 deg. Change of direction per section. Unless specifically detailed otherwise, use 45 deg. Laterals and 45 deg. Elbows for branch takeoff connections. Where 90 deg. Branches are indicated, provide conical type tees.
 3. Duct sealant: non-hardening, non-migrating mastic, or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
 4. Duct cement: non-hardening migrating mastic or liquid neoprene-based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
 5. Ductwork support materials: except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
- C. Flexible Ducts Used Through Out:
1. Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum. Flex is not allowed for return, relief or exhaust applications. The flexible ducts indicated for use in the HVAC. System shall conform to the requirements of ul 181 for class 0 or class 1 flexible air ducts and shall be so identified.
 2. Flexible ducts: where installed in unconditioned spaces other than return air plenums, provide 1" thick 1-1/2 lb. Continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

- 3. Not Used
- D. Fabrication
 - 1. Not Used
- E. Lined Duct
 - 1. Not Used
- F. Duct Liner Adhesive:
 - 1. Not Used
- G. Installation Of Metal Ductwork
 - 1. Not Used
- H. Installation Of Duct Liner
 - 1. Not Used
- I. Installation Of Flexible Ducts
 - 1. Maximum length: for any duct run using flexible ductwork. Installation shall have smooth full radius turns down to diffuser.
- J. Access Panels:
 - 1. Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors, and sprinkler devices required by NFPA. Provide frame as required for finish. Furnish panels to general contractor. Exact locations to be approved by the architect. Minimum size to be 12" x 12", units to be 16-gauge steel, locking device shall be screwdriver cam locks.
- K. Hangers and Supports:
 - 1. Contractor to hire a structural engineer to verify the integrity of the roof deck and existing RTU sub framing, if any exists. Additional structural requirements are the responsibility of this contractor. Submit to the landlord in writing a signed and sealed letter from a licensed structural engineer indicating adequate structural support beneath the RTU's. Include drawings and calculations for any supplemental framing required. Do not place units until authorized by the landlord.
 - 2. Support all piping, ductwork and equipment by hangers or brackets. Furnish structural steel members where required to support piping and equipment. No portion of piping or valves shall be supported by equipment.
 - a. Ductwork -support by means of hangers as follows:
 - b. Duct width hanger size and type max. Spacing
 - c. 30 or less (#16 gage) 8
 - d. 31 to 60 (#14 gage) 8
 - e. 61 to 90 3/8" dia. Rod 8
 - f. A pair of hangers shall be located at every transverse joint and elsewhere according to the table.
- L. Ceiling Air Diffusers:
 - 1. Diffuser faces:
 - a. Round: Not Used

- b. Square: square housing, core of square concentric louvers, square or round duct connection.
 - c. Linear: Not Used
- M. Diffuser Mountings:
 - 1. Surface mount: diffuser shall have rolled edge below finished ceiling for surface mounting or diffuser shall be furnished with accessory plaster frame.
 - a. Lay-in: Not Used
- N. Diffuser Dampers:
 - 1. Opposed blade dampers: multiple opposed blade dampers connected to linkage adjustable from face of diffuser with key.
 - 2. Integral: combination volume control and pattern adjustment for linear diffusers.
- O. Diffuser Acoustic Performance
 - 1. NC less than or equal to 25
- P. Diffuser Accessories:
 - 1. Plaster ring: perimeter ring designed to act as plaster stop and diffuser anchor.
 - 2. Titus trm frame kit
- Q. Diffuser Finishes:
 - 1. White enamel: semi-gloss white enamel prime finish.
- R. Manufacturer:
 - 1. Subject to compliance with requirements, provide diffusers of one of the following:
 - a. Anemostat products div., dynamics corp. Of America.
 - b. Metal-aire
 - c. Titus products div., philips industries, inc.
 - d. Tuttle and bailey.
 - e. Price
- S. Ceiling & Wall Registers & Grilles:
 - 1. Steel construction: manufacturer's standard stamped sheet steel frame and adjustable blades.
- T. Register Dampers:
 - 1. Opposed blade: adjustable opposed-blade damper assembly, key operated from face of register.
- U. Register and Grille Finishes:
 - 1. White enamel: semi-gloss white enamel prime finish.
 - 2. Register and grille acoustic performance: nc less than or equal to 25
- V. Manufacturer:
 - 1. subject to compliance with requirements, provide diffusers of one of the following:
 - a. Anemostat products div., dynamics corp. Of america.
 - b. Metal-aire
 - c. Titus products div., philips industries, inc.
 - d. Tuttle and bailey.
 - e. Price
- W. Split system dx/heat pump with auxilliary electric heat or equal (submittal required)

X. Warranty:

1. Warranty on compressor and heat exchanger: provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
 - a. Warranty period: 5 years from date of owner acceptance.

Part 3 - GENERAL SYSTEM DESCRIPTION

1. Indoor,
2. Split-system air-handling unit for use in commercial or residential split systems. Unit shall have a multi-position design and shall be capable of horizontal installation in a ceiling, without ductwork.
3. Unit must be designed to operate with r-410a refrigerant circuit with a matching air-cooled condensing unit, for matched systems approved by the manufacturer.
4. Quality Assurance
 - a. All coils shall be designed and tested in accordance with ASHRAE 15 safety code for mechanical refrigeration, latest edition.
 - b. Unit shall be constructed in accordance with ul and etl, Canada, standards and shall carry the ul and Canada, labels.
 - c. Unit insulation and adhesive shall comply with nfpa-90a requirements for flame spread and smoke generation. Insulation shall contain an epa-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards g21 and 22.
 - d. Unit shall be manufactured in a facility registered to the iso 9001:2000 manufacturing quality standard.
 - e. Direct-expansion coils shall be leak tested at 150 psig and pressure tested at 650 psig and qualified to ul burst test at 1980 psig.
 - f. Unit will be certified for capacity and efficiency and listed in the latest ahri consumer's directory of certified efficiency ratings.
- B. Delivery and Storage
 1. Units shall be stored and handled per manufacturer's recommendations.

Part 4 - PRODUCTS (INDOOR UNIT)

A. Equipment

1. Indoor mounted, draw-thru, split-system air-handling unit that can be used with or without ductwork in a suspended horizontal configuration or free-standing vertical

configuration. Unit shall be indoor component of a heat pump system. Unit shall consist of forward-curved belt-driven centrifugal fan(s), motor and drive assembly, prewired fan motor contactor, factory-installed refrigerant metering devices, bypass check valves, cooling coil, 2-in. Disposable air filters, and condensate drain pans for vertical or horizontal configurations.

2. Base Unit:

a. Cabinet shall be constructed of mill-galvanized steel.

3. Cabinet Panels: Shall be fully insulated with 1/2-in. Fire-retardant material.

Insulation shall contain an epa-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards g21 and 22.

4. Unit shall contain corrosion-free condensate drain pans for both vertical and horizontal applications. Drain pans shall have connections on right and left sides of unit to facilitate field connection. Drain pans shall have the ability to be sloped toward the right or left side of the unit to prevent standing water from accumulating in pans.

5. Unit shall have factory-supplied 2-in. Throwaway-type filters installed upstream from the cooling coil. Filter access shall be from either the right or left side of the unit.

B. Coils:

1. Coils shall consist of 3 rows or 4 rows of copper tubes with sine-wave aluminum fins bonded to the tubes by mechanical expansion. Coil tubing shall be internally rifled to maximize heat transfer. Refrigerant line connections shall be made on the same side of the coil.

2. Coils shall feature factory-installed thermostatic expansion valves (txvs) for refrigerant control. The txvs shall be capable of external adjustment.

3. Coils shall have a factory-installed bypass line and check valve assembly around the txvs to allow liquid flow from the coil to the outdoor unit during heating mode.

C. Motor:

1. Fan motor of the size and electrical characteristics specified on the equipment schedule shall be factory-supplied and factory-installed.

2. Indoor-fan Motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection (motors smaller than 5 hp) or manual reset calibrated circuit breakers (motors equal or larger than 5 hp). Motors are designed and qualified in the "air-over" location downstream of the cooling coil and carry a maximum continuous bhp rating that is the maximum application bhp rating for the motors; no "safety factors" above that rating may be applied.

3. All indoor fan motors 5 hp and larger shall meet the minimum efficiency requirements as established by the most recent energy policy enacted by department of energy.

D. Special Features: (refer to schedule for applicable options)

1. Alternate motor and drive: an alternate motor and medium or high-static drive shall be available to meet the airflow and external static pressure requirements specified on the equipment schedule.
 2. External paint cabinet: where conditions require, units shall be painted with an American sterling gray finish.
- E. Electric Heaters (when scheduled on plan):
1. Heaters for nominal power supply (refer to schedule) shall be factory-supplied for field installation as shown on the equipment drawings. Electric heat assembly shall be UL and ETL, Canada; agency approved, and shall have single-point power wiring. Heater assembly shall include contactors with 24-v coils, power wiring, 24-v control wiring terminal blocks, and a hinged access panel.
 2. Air discharge plenum: plenum shall be factory-supplied to provide free-blow air distribution for vertical floor-mounted units. A grille with moveable vanes for horizontal or vertical airflow adjustment shall be included. Plenum housing shall be field-installed on the unit's fan deck for blow-thru air distribution.
 3. Return air grille: grille shall be factory-supplied for field installation on the unit's return air opening.
- F. Connections:
1. Connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
 2. Connect supply and return water coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 3. Connect supply and return condenser connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 4. Install piping adjacent to unit to allow service and maintenance.

Part 5 - GENERAL (OUTDOOR UNIT)

A. System Description

1. Outdoor-mounted, electrically controlled, air-cooled split system heat pump suitable for on-the-ground or rooftop installation. Unit shall consist of a scroll air-conditioning compressor assembly, an air-cooled coil, propeller-type condenser fans, and a control box. Unit shall discharge supply air upward as shown on contract drawings. Unit shall function as the outdoor component of an air to air electric heat pump system.
2. Unit must be designed with a r-410a refrigerant circuit to match indoor air handler.
3. Unit shall have reversing valve and low-temperature air cut-off thermostat. 1.4. Unit shall have low ambient kit to permit operation down to 0°f.

B. Quality Assurance

1. Unit shall be rated in accordance with ari standard 340/360.

2. Unit construction shall comply with ANSI/ASHRAE 15 safety code latest revision and comply with nec.
 3. Unit shall be constructed in accordance with ul 1995 standard and shall carry the UL and UL, Canada label.
 4. Unit cabinet shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
 5. Air-cooled outdoor coils shall be leak tested at 150 psig and pressure tested at 650 psig and qualified to ul burst test at 1980 psig.
 6. Unit shall be manufactured in a facility registered to iso 9001:2000 manufacturing quality standard.
- C. Delivery, Storage and Handling
1. Unit shall be shipped as single package only, and shall be stored and handled according to unit manufacturer's recommendations.
- D. Operating Characteristics:
1. When combined with the matching condensing unit the system shall be capable of starting and running up to 125 f (52 c) and down to 0°f (-18 c) ambient outdoor temperature.
 2. Unit shall operate at +/-10% from rated voltage.
- E. Electric Heating Terminals
- F. Heaters (Refer To Schedule):
1. General: provide a heavy-duty fan forced wall heater. Heating grid shall be made up of rugged steel fins, copper brazed to non glowing, steel sheathed elements. Unit to have built-in, tamper-proof thermostat or remote thermostat, built in disconnect switch. Front cover shall be decorative 16 gauge welded bar grille. Fan delay and thermal cutout are standard. Provide all required control transformers.
 - a. Manufacturers: subject to compliance with requirements, provide wall heaters of one of the following:
 - b. Berko
 - c. Qmark
 - d. Markel
 - e. Raywall
- G. Installation of Heating Terminals:
1. Install electric heating terminal units including components as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, complying with applicable installation requirements of NEC and NECA'S "Standard Of Installation".
 2. Coordinate with other electrical work, including wiring/cabling, as necessary to properly interface installation of heating terminal units with other work.
 3. Clean dust and debris from each heating terminal as it is installed to ensure cleanliness.
 4. Comb out damaged fins where bent or crushed before covering elements with enclosures.

5. Touch-up scratched or marred heating terminal enclosure surfaces to match original finishes.
 6. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in ul std 486a.
- H. Grounding:
1. Provide equipment grounding connections for electric heating terminals as indicated. Tighten connections to comply with tightening torque values specified in UL Std 486a to assure permanent and effective grounding.
- I. Field Quality Control:
1. Upon completion of installation of electric heating terminals, and after building circuitry has been energized, test heating terminals to demonstrate capability and compliance with requirements. Where possible, field correct malfunctioning units, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting. Replace electric heating terminals and accessories which are damaged and remove damaged items from construction site.

END OF SECTION 230000

SECTION 260000
ELECTRICAL

Part 1 - GENERAL

A. Scope

1. Furnish and install a completely wired and operational electrical system as shown on the drawings and specified herein, including but not limited to, these major items.
 - a. Lighting fixtures as indicated and specified on the plans.
 - b. Electrical panels, controls, service, disconnects, conduit wiring, etc., for all outlets and equipment.
 - c. Telephone outlets and as indicated.
 - d. and outlets for alarm, computer, and security systems as indicated.
 - e. Control wiring for electrical systems.
2. Provide permits and inspections as required.

B. Codes, regulations and standards

1. The installation shall comply with applicable local and state codes and ordinances, with the regulations of the latest adopted edition of the following codes and with the requirements of the power and telephone companies furnishing services to this installation.
2. The following industry standards, specifications and codes are minimum requirements:
 - a. NEMA- National Electrical Manufacturer's Association.
 - b. NEC -National Electrical Code
 - c. UL-Underwriter Laboratories Incorporated Standards
 - d. ANSI-American National Standards Institute
 - e. IEEE-Institute of Electrical And Electronics Engineers
 - f. NESC-National Electrical Safety Code

C. Inspection of site

1. Prior to submitting a bid for electrical work, the electrical contractor shall visit the site of the proposed construction and shall thoroughly acquaint himself with existing utilities and working conditions to be encountered, etc. Allowance will not be made for non-compliance with this condition after bidding.

D. General workmanship

1. All work shall be executed and finished in a practical manner and shall present a neat and workmanlike appearance when completed.
2. All work must be acceptable to the owner. Where a detailed method of installing the work is not specified or indicated, install work as directed by the owner.

E. Related work by others

1. Electrical drawings identify utility service requirements for power, telephone, and cable tv within and up to five feet outside the building. Utility electrical service transformer(s), where shown on the site plan, are for information only and indicate

the preferred point of service. Utility systems, pull boxes, and other structures, where shown on the site plan, are also for information only and indicated preferred routing. The electrical contractor shall refer to utility service drawings for actual utility service requirements for this project. Utility systems shall be constructed in accordance with the approved utility service drawings. It shall be the electrical contractor's responsibility to contact and follow-up with all utility companies to obtain both preliminary and final design drawings for this project.

- a. The electrical contractor shall coordinate the installation of the electrical service entrance, meet all power company requirements, and shall pay all utility company charges.
- b. The local telephone company will furnish and install all telephone wiring and equipment and will make all final telephone connections. The electrical contractor shall coordinate the installation of the telephone service entrance, meet all telephone requirements, and shall pay all utility company charges.
- c. The electrical contractor shall coordinate the installation of the cable service entrance, meet all cable company requirements, and shall pay all utility company charges.

F. Cooperation with other contractors

1. Cooperate with the other trades so that the installation of the electrical outlets and equipment will be properly coordinated. , fixtures, and other equipment locations shall be checked with the other trades to avoid conflict with the piping, ductwork, steel beams, or other obstructions.
2. Carefully check the locations of the outlet boxes and determine that they have not been disturbed during the installation of materials of other trades.
3. Coordinate the location of trenches and conduits for utility services and other disciplines with the general contractor.

G. Mechanical and electrical coordination

1. Any device which carries the full load current of the electrically driven machinery, as opposed to the control of instrumentation current in the holding coil, is a power circuit and is the responsibility of the electrical contractor. Control or instrumentation circuits connecting holding coils to the control system as specified by the mechanical engineer are the responsibility of the mechanical contractor.
2. The power circuit is defined as all devices necessary to operate, and as required by code to protect and service the unit, including branch circuit protective devices, disconnects, magnetic motor starters with running overload and single phasing protection, magnetic contactors, etc.
3. The control or instrumentation circuit is defined as all devices necessary to interface the electrical power circuit with the control system as specified by the mechanical engineer including , boxes, fittings, conductors, electric-pneumatic switches, pneumatic-electric switches, electrical and pneumatic relays, pneumatic tubing, etc.
4. The electrical contractor shall be responsible to provide 120v duple receptacles within 25 feet of all roof mounted equipment, per NEC 210.63.

H. Drawings

1. The drawings indicate the general arrangement and locations of the electrical work. Information presented on these drawings are as accurate as planning can determine, but field verification of all dimensions, locations, levels, etc., to suit field conditions is required. Review all architectural, structural, and mechanical drawings and adjust all work to meet the requirements of conditions shown. The architectural drawings shall take precedence over all other drawings. Discrepancies between different plans, or between drawings and specifications, or regulations and codes governing the installation shall be brought to the attention of the engineer in writing before the date of bid opening. Where discrepancies or conflicts occur, the bid shall reflect the most stringent requirements. Electrical contractor shall be responsible to field measure and confirm mounting heights and location of electrical equipment with respect to counters, etc. Do not scale distances off the electrical drawings. Use actual building dimensions.
2. Upon completion of the work under these drawings and specifications, the electrical contractor shall provide the owner with a complete set of marked-up electrical drawings showing the "as-built" condition of the work. Bond prints of the drawings required will be furnished by the owner, for this purpose.
3. All operating instructions, parts lists and spare parts for material and equipment furnished and/or installed by the electrical contractor shall be turned over to the owner (three copies).

I. Shop drawings and approvals

1. Submittals shall consist of detailed shop drawings, specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those optional accessories which are excluded.
2. Each submittal shall be accompanied shall bear a stamp stating that the submittal must be thoroughly reviewed by the contractor and is in full compliance with the requirements of contract documents. Cover letters shall list in full the items and data submitted. Failure to comply with these requirements shall constitute grounds for rejection of data.
3. The contractor shall submit detailed drawings of all electrical equipment and generator rooms, yards, and utility areas. Minimum scale: 1/4"-1'-0".
4. As part of the equipment submittals, the manufacturer shall provide anchorage calculations for floor and wall mounted electrical equipment. Structural calculations shall be prepared and signed by registered structural engineer in California.
5. All resubmittals shall include a cover letter that lists the action taken and revisions made to every drawing and equipment data sheet in response to submittal review comments. Failure to include this cover letter will constitute rejection of the resubmittal package.

6. Contractor shall submit short circuit and coordination studies signed by a registered electrical engineer. Studies shall be performed in acceptance with IEEE guidelines. Contractor shall be submitted for architect-engineer review prior to ordering and installing any equipment. Contractor shall ensure that the actual feeder lengths match studies (revise studies if necessary). Service equipment markings as required per NEC 110.24 shall be based on contractor submitted studies.
7. Submit conduits; fittings; outlet pull and junction boxes; safety switches; fuses; transformers; panelboards; switchboards; circuit breakers; lighting control system/devices; and fire alarm systems.

J. Substitutions

1. All requests for substitutions shall conform to the general requirements and procedure outlined in division 1.
2. Where items are noted as "or equal", a product of equal design, construction and performance will be considered.
3. Substitutions shall be equal, in the opinion of the owner's representative, to the specified product.
4. The burden of proof of equality of a proposed substitution for a specified item shall be upon the electrical contractor. Electrical contractor shall support its request with sufficient test data, photometric analysis, detailed breakdown defining cost savings, and other means to permit the architect and/or engineer to make a fair and equitable decision on the merits of the proposed substitution. Any item by a manufacturer other than those specified, or a of brand name or model number will be considered a substitution. The architect and/or engineer will be the sole judge of whether or not the substitution is equal in quality, utility and economy to that specified.
5. Approval of a substitution shall not relieve electrical contractor from responsibility for compliance with all requirements of the contract documents. Electrical contractor shall bear the expense for any changes in other parts of this work or other work caused by the proposed substitution.
6. If architect and/or engineer rejects electrical contractor's substitute item on the first submittal, electrical contractor may make only one additional request for substitution in the same category.

K. Guarantee & Testing

1. Guarantee all material furnished and all workmanship performed for a period of one year from the date of final acceptance of the work. Any defects developing within this period, traceable to material furnished as part of this section or workmanship performed hereunder, shall be corrected as necessary at no cost to the owner.
2. System shall be tested for proper operation. If test show that work is defective, electrical contractor shall make corrections as necessary at no cost to the owner.

L. Labeling

1. Provide engraved name plates on switchboards, panel boards, disconnect switches, motor control centers, transformers, etc., indicating equipment designated (or designation of equipment served) and voltage.

M. Housekeeping Pads

1. Provide 4-inch-high concrete equipment pads for all floor-mounted equipment including switchboards, motor control center, transformers, etc.

N. Materials

1. All materials shall be new and of quality as specified on the plans or specifications and must carry the underwriter's laboratories approval covering the purpose for which they are used, in addition to meeting all recruitments of the current applicable codes and regulations.
2. Electrical contractor shall be responsible for replacing equipment which is damaged due to incorrect field wiring provided under this section or factory wiring in equipment provided under this section.

O. Storage And Handling of Material

1. Deliver materials and equipment to the project in the manufacturer's original, unopened, labeled containers. Protect against moisture, tampering, or damage from improper handling or storage. Electrical contractor shall protect and be responsible for any damage to work or materials until final acceptance by the owner, and shall make good without cost to the owner, any damage or loss that may occur during this period.
2. Arrange for timely delivery of materials and equipment to the jobsite in order to minimize the length of time between delivery and installation.
3. Arrange for timely delivery of owner supplied materials and equipment to the jobsite in order to minimize the length of time between delivery and installation.
4. Cover and protect any material which may be affected by the weather while in transit or stored at the project site. Any material found defective or not installed in accordance with the contract documents may be rejected by the engineer.
5. No electrical work shall be installed in areas where other trades' work might cause physical damage to wires, , equipment, boxes, or fittings until the other trade's work has been completed. Any equipment or materials which become damaged shall be removed and replaced at no extra cost to the owner.

P. Clean-up

1. Keep the premises free from accumulation of waste materials, or rubbish caused by employees or work under this division of the specifications. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises "broom-clean".

Q. Excavation, Cutting and Fitting

1. Perform the excavation, cutting, fitting, repairing, and finishing of the work necessary for the installation of electrical equipment. However, no cutting of the

work of other trades or of any structural member shall be done without the consent of the architect.

R. Excavation and Backfill

1. Perform all excavation and backfilling required for work performed under this division of the specifications. Trench bottoms shall be graded true and free from stones or soft spots. Use excavated materials for backfill unless off site materials are deemed necessary by the architect. Trenching and backfilling for electrical and telephone utility services to building shall be provided by the electrical contractor in accordance with utility company requirements.
2. Verify location of existing underground utilities prior to trenching.

Part 2 - PRODUCTS AND EXECUTION

A. Conduit

1. Instead of using conduit, Non-Metallic sheathed cable (NM-B) may be used in residential applications in compliance with IRC allowable wiring methods .
2. GRC may be used in all areas. IMC may be used in indoor locations not in contact with earth. EMT may be used in indoor locations not in contact with earth, not in concrete slabs or walls and not subject to damage. PVC may be used in or below concrete and direct buried in earth. Liquid-tight flexible steel conduit shall be for outdoor final connections to equipment not to exceed 36".
3. Cover metallic conduit in contact with earth or fill with polyethylene tape spiral wrapped, 1/2" lapped to provide double thickness. Tape shall be scotch no. 50 tape. Conduit and ducts not under buildings and feeder ducts shall be installed per NEC 300.5, except that the bends in conduit larger than 1" in diameter shall be made with galvanized steel conduit treated as noted above. Make joints with compound to be watertight.
4. Any installed conduit sizes shall be as required by code and as indicated or specified on drawings. No conduit smaller than 3/4-inch trade size shall be used.
5. Penetration through floor slabs where subject to damage shall be in wrapped rigid steel. Schedule 40 PVC elbows and penetrations may be used in slab on grade where penetrations occur in protected areas (walls, electrical rooms, etc.).
6. Wire, Conduits and outlets shall be concealed with the building structure, except that certain motor and lighting feeder conduits may be run exposed in certain areas as indicated on the drawings. Conduit shown to be installed in cabinets, counters, and casework shall be run as directed by the architect.
7. Any conduit serving roof mounted equipment and devices including HVAC equipment, GFCI maintenance receptacles and duct type smoke detectors shall be routed in the ceiling space. Conduit shall penetrate roof at equipment locations only no wiring or conduit shall be installed horizontally across roof surface.

8. Any flexible metallic and non-metallic conduit systems shall have a code sized copper ground conductor. Increase conduit size as required.
 9. Any empty conduit systems shall have a 200-pound test pull cord installed to facilitate installation of future wire.
- B. Fittings
1. EMT-fittings and conduit bodies shall be steel, malleable iron or die cast compression or set screw type.
 2. IMC and GRC shall be steel or malleable iron type and shall engage a minimum of five (5) threads.
- C. Outlet, Pull and Junction Boxes
1. Pull and/or junction boxes shall be installed wherever shown on the drawings or as required by code.
 2. Each Switch, Light, Receptacle, Junction, Pull and Outlet box shall be of the one-piece, knockout type, in general 4-inch square, 2 1/8-inch with plaster ring. Plaster rings shall be set to provide not more than 1/8" from wall surface to ring. In no case shall plaster ring project beyond surface of wall. Single gang rings similar to steel city 52050 shall be used for 4" boxes in unfinished brick. Number 180 boxes may be used for unfinished masonry flush wall outlets. Center all outlet boxes in block course.
 3. Boxes installed in poured cement floors shall be flush type cast iron with watertight gasketed covers gray metallic finish. Where boxes are installed in floors with tile or carpet floor covering, covers shall be of the recessed type to accommodate the floor covering.
 4. Boxes installed for the alarm, computer and security system shall be provided with appropriate cover plates.
 5. Pull boxes shall be the types, size and design as approved by the NEC for the class of installation required.
 6. Pull boxes and outlet boxes shall be sized by the electrical contractor as required by the NEC based on number of conductors, yokes, straps, etc., used in the installation.
- D. Wire
1. Match building standards if applicable in an existing building condition, unless otherwise follow the specifications below.
 2. Conductor size shown on the drawings based on copper wire. Unless otherwise specified, all wire shall be 75-degree c type thwn or xhhw. All branch circuit and feeder wiring shall be copper. Where raceway and cables exposed to direct sunlight on or above rooftops, provide type xhhw-2 insulated conductors.
 3. Wires shall be marked with color to simplify circuit identification. Unless otherwise required by local ordinances, identification shall be as follows:
 - a. 120/208v and 120/240v - phase a: black, phase b: red, phase c: blue, neutral: white, ground: green.
 - b. 277/480v - phase a: brown, phase b: orange, phase c: yellow, neutral: gray, ground: green.
 4. The wire shall be #12 AWG unless otherwise indicated.

5. No wire shall be installed in a conduit system until the conduit system is complete. Use U.I. Approved lubricant to facilitate the installation of the conductors in the conduit system.
6. Conductors no. 10 AWG and smaller shall be solid. Conductors larger than no. 10 AWG shall be stranded.
7. MC cable is approved only for light fixture "whips" no longer than 6".

E. Wiring Devices

1. Switches: wall switches shall be specification grade ac silent type switches 20a, 120 - 277 volt. Hubbell 1221 (sp), 1222 (dp), 1223 (3-way) and 1224 (4-way). Dimmers shall be specification grade with reset slide control. Color shall be as approved by the architect/owner. Match building standard (if existing).
2. Receptacles: duplex type outlets shall be heavy duty, specification grade NEMA 5-20r, 20a, 120v grounded type equal to hubbell 5362. Isolated ground outlets shall be equal to hubbell ig5362. Special application receptacles shall be as indicated on plans and verified with equipment supplier. Color shall be as approved by the architect/owner. Match building standard (if existing).
3. Weatherproof receptacles: covers shall be hubbell wpfs26 with 5362 duplex outlet or equal.
4. GFCI receptacles: shall be hubbell gf5362. GFCI receptacles shall be used in all outdoor applications as well as those placed within 6' of water source and all other NEC required locations.
5. Mounting heights: switches - +48 inches. Receptacles - +18 inches. Communication devices - +18 inches. Fire alarm devices - as required by ADA, NFPA 72 or authority having jurisdiction. All mounting heights are to centerline of device.
6. Device plates shall be equal to sierra smooth-line plastic wall plates. Color shall be as approved by the architect/owner. Match building standard (if existing).
7. In all cases, switches controlling lighting are to be located on the strike side of doors. Locations indicated for switch and outlets are approximate. Owner may make minor relocations at no additional charge.

F. Lighting Fixtures

1. Coordinate the final location of fixtures shown diagrammatically on the drawings with other trades in order to avoid interferences. Relocate fixtures as required as part of the work under this division if new location is within a five-foot radius of location shown.
2. Provide all lighting fixtures, wired and connected. The drawings indicate the fixtures for each location. Electrical contractor shall verify fixture locations, mounting requirement and u.I. Labeling of all fixtures prior to ordering. Include all accessories need for a complete installation including mounting clips, plaster framers, hangers, and hardware in base bid. Provide lamps for all fixtures. Verify ceiling construction before ordering recessed units.
3. Adjustable fixtures shall be located and properly aimed as directed by the architect or the lighting designer.

4. Support recessed fixture from ceiling structural support per adopted building codes.
5. All fixtures to bear the U.I. Label. All outdoor fixtures shall be U.I. Labeled for wet or damp location as defined by NEC article 100.

G. Lamps

1. Lamps shall be by the same manufacturer. Lamps shall be manufactured by GE, Philips, Ushio, Nichia, Samsung led or cree.
2. All lamps shall be light emitting diode (led) type - minimum 80 cri indoors and 70 cri outdoors, 3500k (u.n.o.), 50,000 rated lamp hours. LEDs must be from the same manufacturer and batch.

H. LED Drivers

1. Drivers shall be easily accessible without the use of special tools. Luminaires shall be capable of being operated by standard motion/vacancy sensors, daylight sensors, and dimmers. Dimming for 0-10 volt dc control circuits minimum. Drivers shall be specifically compatible with lighting control system being provided.
2. Temperature rating; -20 degrees Celsius minimum starting temperature. Luminaires accessories shall be able to withstand temperatures in excess of 110 Fahrenheit degrees.
3. 90-percent minimum power factor, 50-60 hz frequency, total harmonic distortion less than 20-percent, led and driver life expectancy of 50,000 minimum projected hours at 6,000 hours testing for both LEDs and drivers; luminaires in contact with insulation material shall be ic rated; rated for dry and damp locations.
4. Approved driver manufacturers include Osram, Philips, Kenall, Eldoled, general electric, and other only if approved.

I. Safety Switches

1. Safety switches shall be general duty type, 250 volt for 208 volt equipment and heavy duty type, 600 volt for 480 volt equipment. Safety switches shall have the number of poles required. Wire terminations shall be listed as specified by the NEC. Safety switches for air conditioning use shall be of the fusible type where recommended by equipment manufacturer. Fusible switches shall accept class 'r' fuses only and will reject all other types. The switch size, number of poles and voltage rating shall be as required by code and as indicated on the drawings. Where outside the building, the switches shall be type NEMA 3r weatherproof. All switches shall be lockable.
2. Provide dymo-tape tag inside cover of each fusible switch, indicating size and type of fuses provided.

J. Fuses

1. Fuses shall be dual element time delay type, as manufactured by bussman mfg. Company, or as indicated or required by equipment supplied.
2. Provide two (2) sets of three (3) spare fuses for each size and type provided on this project. Install fuses in a hinged door, sheet metal storage cabinet equipment with clips or cubicles, each marked with size and type of fuse stored therein. Provide nameplate "spare fuses." install in location as directed by owner.

K. Service Entrance

1. The service entrance equipment size, voltage and rating shall be as indicated on the drawings. Provide copper busing unless otherwise noted or permitted. Equipment shall carry the u.l. Label and shall conform to the power company regulations.
2. Electrical contractor is responsible to verify and confirm that equipment submitted shall fit within the allotted space requirements shown on the plans. Drawings indicate maximum dimensions for the switchboards including clearances between switchboards on adjacent surfaces and other items. Comply with maximum dimensions. If any space or size discrepancies are anticipated, it is the electrical contractor's responsibility to notify the engineer prior to submittal. Once the submittals have been approved it is the electrical contractor's responsibility to install the equipment within the allotted space at no additional cost to the owner.
3. Service entrance equipment shall be manufactured by general electric, square d, cutler-hammer, siemens or approved equal.
4. All overcurrent protection devices and electrical distribution equipment shall be fully (100%) rated for available fault current indicated. Series rated devices are note acceptable.

L. Transformers

1. Transformers shall be dry type with copper windings, 115-degree temperature rise, and doe10 cfr part 431 appendix a of subpart k 2016. Energy efficiency under doe 2016 requirements is to be energy verified by u.l.
2. All transformers shall be provided with class 220-degree Celsius insulation system and shall be completely enclosed except for ventilation openings.
3. Transformers shall be 115-degree temperature rise above 40-degree Celsius ambient temperature.
4. Transformers shall be equipment with 2-1/2% (2 above and 2 below normal voltage) primary taps.

M. Panelboards

1. Circuit breaker type as indicated on drawings. All panels shall have panelboard type construction with bolt-on circuit breakers. Panels indicated as load centers shall have plug-on circuit breakers.
2. Busing shall be copper unless otherwise noted or permitted.
3. Manufacturers shall be general electric, square d, cutler-hammer, siemens with voltage, sizes and rating as indicated on drawings. All panelboards in the facility shall be by the same manufacturer.
4. The circuit breakers shall be operable in any position and be removable from the front of the panelboard without disturbing the adjacent units. Branch breakers shall be of such design that combination of single-pole, double-pole and three-pole breakers can be assembled on the same panel. Each branch circuit shall be clearly numbered. Branch and main terminals shall be of the solderless type. Handle ties to form multi-pole breakers are note acceptable.
5. Wire termination for panelboards, load centers and circuit breakers shall be listed as specified by the NEC.

6. Provide a printed circuit index behind clear plastic cover on inside of door. Information shall include room and type of load served. All circuit breakers shall be identified, including spares. Index card frame shall be metal, secured to door.
7. Where panelboards are installed flush with the walls, extend empty conduits from the panelboard to an accessible space above or below. Provide 3/4" (minimum size) conduit for every three single spare circuit breakers or space or equivalent multi-pole arrangement, or fraction thereof, but not less than two conduits for each panelboard.

N. System Grounding

1. Grounding shall comply with requirements of article 250. All exposed noncurrent-carrying metallic parts of electrical equipment, metallic raceway systems, metallic cable armor, grounding conductor of nonmetallic sheathed cables, grounding conductor in nonmetallic raceways, and grounded conductors of the wiring system shall be grounded.
2. The grounded conductor (neutral) of the wiring system shall be connected to the system grounding conductor at a single place in each system by removable bonding jumpers, sized according to the applicable provisions of the NEC. The grounded conductor (neutral) to the grounding conductor connection shall be located in the enclosure for the system's overcurrent protection or where otherwise indicated on the plans or specifications.
3. Ground bus separate from the neutral bus shall be provided in all switchboards and panelboards. Ground bus shall be retorqued (checked) prior to energizing equipment per manufacturer's recommendations.
4. Ground buses and neutral buses in all distribution panels, switchboards, panelboards and those provided in any equipment shall be isolated except where required to be connected as specified above for the service entrance and in transformer terminal compartments.
5. When indicated on the drawings, equipment grounding conductors shall be extended from the ground bus in the distribution equipment to the receptacle, fixture or device lugs where they are provided. When not provided, they shall be connected to equipment enclosures. The connection shall be arranged such that removal of the receptacles, the equipment ground conductors, or the ground jumpers from ground busing shall not affect the ground system.
6. Raceways may not be used as a grounding conductor for power and lighting circuits. Every conduit supplying power and lighting circuits shall have a separate code sized green ground wire installed in the conduit to ensure a continuous grounding path.
7. In inaccessible locations make connections by exothermic weld process.
8. In accessible locations, connection shall be made with approved bolted bronze grounding devices.

O. Equipment Connections

1. All motors shall be wired to conform with manufacturer's recommendations and with applicable codes. Furnish necessary materials, such as wire, fittings, etc.

Required to connect motor. However, motors, controls, etc. Shall be furnished by the supplier of the driven equipment. Verify equipment location and sizes with the trade supplying the motor before installing the wiring or outlets.

2. Final connection to all HVAC or motor loads from load side of disconnect shall be made using copper wire only, aluminum wire is not acceptable.

P. Communication Systems

1. For all communication outlets provide double gang back box with single gang plaster ring. Provide blank cover plates for all unused boxes.
2. Provide 3/4" fire rated plywood for telephone terminal.

END OF SECTION 260000

DIVISION 31 - CIVIL SPECIFICATIONS

TABLE OF CONTENTS:

SECTION 310010 - COORDINATION AND MEETINGS
SECTION 310011 - SUBMITTALS
SECTION 310012 - QUALITY CONTROL
SECTION 310013 - CONTRACT CLOSEOUT
SECTION 310014 - MATERIAL AND EQUIPMENT
SECTION 310020 - CLEARING AND RESTORATION
SECTION 310021 - DEMOLITION
SECTION 310022 - TRENCH EXCAVATION AND BACKFILL
SECTION 310023 - STRUCTURE EXCAVATION AND BACKFILL
SECTION 310024 - SEEDING
SECTION 310025 - EMBANKMENT, PLACING AND COMPACTING
SECTION 310026 - COMPACTION CONTROL AND TESTING
SECTION 310027 - CONCRETE
SECTION 310028 - CONCRETE PAVING
SECTION 310029 - ASPHALT PAVING
SECTION 310200 - WATER PIPE AND FITTINGS
SECTION 310201- GATE VALVES
SECTION 310205 - FIRE HYDRANT
SECTION 310206 - WATER SERVICE CONNECTION
SECTION 310207 - HYDROSTATIC TESTING OF POTABLE LINES
SECTION 310208 - DISINFECTION OF POTABLE LINES
SECTION 311200 - SANITARY SEWER LINES AND APPURTENANCES
SECTION 314100 - TESTING GRAVITY SEWER LINES AND MANHOLES

SECTION 310010

COORDINATION AND MEETINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination
- B. Field Engineering
- C. Alteration Procedures
- D. Cutting and Patching
- E. Preconstruction Conference
- F. Progress Meetings

1.2 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of demolition.
- B. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion.

1.3 FIELD ENGINEERING

- A. Maintain a complete and accurate log of survey work as it progresses.
- B. Verify location of survey control points prior to starting work.
- C. Promptly notify Engineer of any discrepancies discovered.
- D. Contractor shall locate and protect survey control and reference points. Contractor shall report immediately to Engineer whenever any control or reference point is lost or destroyed or requires relocation.
- E. Verify control datum for survey is that shown on Drawings.
- F. Provide field engineering services. Utilize recognized engineering survey practices. Establish elevations, lines, and levels utilizing recognized engineering survey practices.

1.4 ALTERATION PROJECT PROCEDURES

- A. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original specified condition.
- B. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

1.5 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Execute Work by methods which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.
- C. Cut rigid materials using masonry saw or core drill.
- D. Identify any hazardous substance or condition exposed during the Work to the Engineer for decision or remedy.

1.6 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule a conference after Notice of Award.
- B. Attendance Required: Owner, Engineer and Contractors.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, Schedule of Values, and progress schedules.
 - 5. Designation of personnel representing the parties in Contract, and the Engineer.
 - 6. Procedures for processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
 - 7. Scheduling.

1.7 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to Engineer, Owner, Other Contractors, subcontractors, suppliers, participants, and those affected by decisions made.
- C. Attendance Required: Job Superintendent, major subcontractors, Owner, Engineer, Resident Project Representative, as appropriate to agenda for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems which impede planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Plan progress during succeeding work period.
 - 9. Coordination of projected progress with Owner's operations and between the various Contractors.
 - 10. Maintenance of quality and work standards.
 - 11. Effect of proposed changes on progress schedule and coordination.
 - 12. Other business relating to Work.

END OF SECTION

SECTION 310011

SUBMITTALS

PART 1 - GENERAL

1.8 SECTION INCLUDES

- A. Submittal procedures.
- B. Demolition progress schedules.
- C. Shop drawings.

1.9 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer approved form.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail numbers, and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed by authorized Contractor personnel, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents. Application of the stamp with signature or initials filled in shall be conclusive as to the making of such certification.
- E. Schedule submittals to expedite the Project, and deliver them to Engineer at business address. Coordinate submission of related items.
- F. Identify variations from Contract Documents and Product or system limitations.
- G. Provide space for Contractor and Architect/Engineer review stamps.
- H. Revise and resubmit submittals as required, identify all changes made since previous submittal by specific notation or color highlighting on the drawings or product data.
- I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.10 DEMOLITION PROGRESS SCHEDULES

- A. Submit initial progress schedule in duplicate within 15 days after date of Owner-Contractor Agreement for Engineer review.

- B. Revise and resubmit as required.
- C. Submit revised schedules bi-weekly, identifying changes since previous version.
- D. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner.

1.11 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.
- B. After review, reproduce and distribute in accordance with paragraph on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

END OF SECTION

SECTION 310012

QUALITY CONTROL

PART 1 - GENERAL

1.12 SECTION INCLUDES

- A. Quality assurance/control
- B. References

1.13 QUALITY ASSURANCE/CONTROL

- A. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances codes, or specified requirements indicate higher standards or more precise workmanship.
- B. Utilize workers qualified to produce workmanship of specified quality.

1.14 REFERENCES

- A. Conform to reference standard by date of issue current on date for receiving bids.
- B. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

END OF SECTION

SECTION 310013
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.15 SECTION INCLUDES

- A. Closeout Procedures.
- B. Final Cleaning.
- C. Project Record Documents.

1.16 RELATED SECTIONS

- A. Section 01300 - Submittals

1.17 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- C. Make all submittals not previously made.

1.18 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean site; sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste and surplus materials from the site.

1.19 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings.
 - 2. Specifications
 - 3. Addenda.

4. Change Orders and other Modifications to the Contract.
 5. Reviewed shop drawings.
- B. Store Record Documents separate from documents used for demolition.
 - C. Record information concurrent with demolition progress.
 - D. Record Documents and Shop Drawings: Legibly mark each item to record actual demolition including:
 1. Measured horizontal and vertical locations of underground pipelines and appurtenances, referenced to permanent surface improvements.
 - E. Submit documents to Engineer.

END OF SECTION

SECTION 310014

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and Handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals

1.3 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products place on sloped supports above ground.
- C. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- D. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- E. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

1.6 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions (the words "or equal"): Submit a request for substitution for any manufacturer not named.

1.7 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only within 15 days after date of the Notice to Proceed.
- B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 2. Submit shop drawings, Product data, and certified test results attesting to the proposed Product equivalence.
 3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

END OF SECTION

SECTION 310020

CLEARING AND RESTORATION

PART 1 - GENERAL

1.1 DESCRIPTION

The contractor shall furnish all labor, equipment, materials, and operations necessary to clear site, right-of-way, or utility easement of trees, shrubs, paving and other improvements, as applicable, and restore as shown on the plans or as directed by the Engineer.

1.2 LIMITS OF WORK

The contractor shall confine his clearing activities to areas defined for work on the drawings or specifically assigned by the Owner's representative for his use.

PART 2 - MATERIALS

Not Applicable

PART 3 - EXECUTION

3.1 TREES AND SHRUBS

- A. The actual area where structures, embankments, paving, or trenches are to be located will be cleared and grubbed. Remove all humus, stumps, roots, and debris to a depth required to provide sound bearing.
- B. In areas which will be disturbed but not required for structures, embankments, paving, or trenches, remove trees and shrubs to within 2-inches of the ground surface.
- C. Trim, as directed, low hanging and unsound or unsightly branches on trees and shrubs that are designated to remain.
- D. Protect from injury all vegetation to remain. To minimize damage to such vegetation, fell trees to center of area to be cleared. Paint damaged portion of trees or shrubs with an approved asphalt base paint. Replace in kind all such trees and shrubs damaged by work under this contract and not scheduled for removal.
- E. Dispose all materials that cannot be utilized in this project as shown on the plans or as directed by the Engineer.

3.2 EXISTING UTILITIES

- A. When existing utilities must be relocated for proper execution of work, notify the Engineer or Owner in writing for determination and decision regarding relocation of said utility. Do not proceed until written instructions are obtained.
- B. The Engineer or Owner shall be required to note locations of relocated utilities.

3.3 PROTECTION OF EXISTING IMPROVEMENTS

- A. Protection shall be provided to prevent damage to existing improvements indicated to remain in place on the Owners property and adjoining properties.
- B. Damaged improvements shall be restored to their original condition, as acceptable to parties having jurisdiction, at no extra cost to the Owner.
- C. The Contractor shall immediately notify the Owner's representative and applicable utility company of any damages to existing utilities. Repairs shall be made in accordance with requirements of the Owner's representative and applicable utility company at no extra cost to the Owner.

3.4 REMOVAL AND REPLACEMENT OF PAVED SURFACES FOR PIPELINE CONSTRUCTION

- A. Removal. Sidewalks, driveways, parking lots, streets, and other paved areas all or partially composed of concrete, asphaltic concrete or bituminous material shall be saw cut and removed to at least the trench width. The contractor shall dispose of all debris from the project site or easement or right-of-way as directed by the Engineer. If a construction joint is within 2 feet of any proposed sawed line, the cut shall be extended to the joint.
- B. Passable Surfaces. Passable surfaces across or along the construction vicinity shall be maintained at all times with gravel, steel plate, or temporary bituminous surfacing material where a sidewalk, driveway, parking lot, street or alley previously existed. During pressure testing, any backfill materials shall be removed to permit observation of pipe during test.
- C. Replacement
 - 1. Concrete Paving for Streets, Parking Lots, & Driveways.
 - (a) Pipeline Construction: After trench has been backfilled, saw cut existing paving one foot from each trench wall. Construct a reinforced concrete slab having a thickness equal to the existing paving or 8-inches, whichever is greater. The top of the new slab shall match existing paving. Concrete shall be 3500 psi at 28 days, with a 3-inch slump. Reinforcement shall be installed at a point 5-inches below top of slab and shall consist of No. 8 bars on six-inch centers perpendicular to trench centerline and No. 6 bars on 12-inch centers parallel to trench centerline. All bars shall be new billet, deformed, and grade 60. The top six-inches of the base shall have a P.I. less than 15 and be

compacted to 95% Standard Density. Provide expansion and contraction joints to match original construction.

(b) Embankments, Paving, and Structures: The new paving shall be constructed to the same dimensions as existed prior to construction or as shown on the plans. Concrete shall be 3500 psi at 28 days, with a 3-inch slump. Reinforcement if used shall be new billet, grade 60, and same size as existing bar(s) or fabric. The top six-inches of base shall have a P.I. less than 15 and be compacted to 95% Standard Density.

2. Concrete Curb and Gutter. Where concrete curbs and gutters are disturbed, they shall be replaced to match original curb and gutter. Concrete shall be 3500 psi at 28 days, with 3-inch slump. Reinforcement where used shall be new billet, deformed, grade 60, and same size as existed in original curb and gutter. The top six-inches of base shall have a P.I. less than 15 and be compacted to 95% Standard Density. Provide expansion and contraction joints to match original construction.

3. Asphalt Paving for Streets, Parking lots & Driveways

(a) Pipeline Construction: After trench has been backfilled, saw cut existing paving one foot from each trench wall. Construct 2-inches of type "C" asphalt on an 8-inch thick reinforced concrete slab. The top of the new paving shall match existing paving. Concrete shall be 3500 psi at 28 days, with a 3-inch slump. Reinforcement shall be installed at a point 5-inches below top of slab and shall consist of No. 8 bars on six-inch centers perpendicular to trench centerline and No. 6 bars on 12-inch centers parallel to trench centerline. All bars shall be new billet, grade 60, deformed. The top six-inches of the base shall have a P.I. less than 15 and be compacted to 95% Standard Density. A tack coat shall be placed on the concrete slab at a rate of 0.30 gallons per square yard before placing asphalt.

(b) Embankments, Paving, and Structures: The new paving shall be constructed to the same dimensions as existed prior to construction or as shown on the plans. Type "C" asphalt shall be used for the top coarse or wearing surface. It shall have a minimum thickness of 3/4-inch.

4. Sidewalks

(a) Concrete sidewalks shall be replaced with 4-inch thick reinforced concrete on a 2-inch sand cushion. The concrete shall be 2000 psi at 28 days, with 3-inch slump. Reinforcement shall be 4x4 welded wire fabric, new billet, plain, located at center of slab. Sand shall have a P.I. less than 15. Contraction joints be on 5-foot centers. Expansion

joints shall be constructed on 20-foot centers and adjacent to structures and curbs.

(b) Asphalt sidewalks shall be replaced with 2-inches of type "C" asphalt on a 2-inch sand cushion. The sand shall have a P.I. less than 15.

5. Gravel Streets, Driveways & Parking Areas. Gravel surfaced streets, parking lots, and other areas shall be replaced with the same type and thickness of material as the original surfacing. In areas disturbed by trench excavation additional surfacing materials shall be placed to compensate for settlement.

6. Dirt Streets, Driveways & Parking Areas. All dirt surfaces disturbed by excavation shall be restored to their original surface using sand having a P.I. less than 15. The top six-inches shall be compacted to 90% Standard Density.

3.5 FENCES

A. Areas where embankments, paving, or structures are to be located, fences shall be removed and disposed as directed by the Owner or Engineer. All posts shall be completely removed including embankment materials.

B. For pipeline installations, fences shall be removed only within the limits of the easement or right-of-way. All fences affected by the project shall be replaced or reconstructed to substantially the same conditions as existed prior to the start of construction. Fences shall be replaced after trenches have been backfilled and accepted by the Owner or Engineer.

3.6 BUILDINGS

A. Permanent Structures. All permanent buildings located within the immediate area of new paving, new structures, pipelines or embankments, shall be demolished per section "Demolition".

B. Portable Buildings

(1) Portable buildings that are located within the immediate area of new pavings, structures, or embankments shall be disposed as directed by the Owner or Engineer.

(2) Portable buildings that are located within pipeline easements or right-of-way shall be removed by the contractor. The property owner shall return the structure to its original location after completion of construction.

3.7 OTHER IMPROVEMENTS

The contractor shall remove and reconstruct or replace all other existing improvements affected by this project which are not specifically scheduled for removal or described heretofore. All

improvements shall be replaced or reconstructed to substantially the same conditions as existed prior to the construction.

3.8 RESTORATION OF GRADE

On all easements, right-of-ways, and elsewhere as noted on the plans, the contractor shall restore the grade of the surface of earth as reasonably may be done to the grade existing prior to construction. All lawns shall be hand raked and the area left as nearly as possible to its original condition.

3.9 CLEAN-UP

- A. Embankments, Paving, structures, etc.: Upon completion of the work, the contractor shall leave the site in as neat, clean, and orderly condition as may be reasonably done.
- B. Pipeline Work. After trenches have been backfilled and accepted by the Owner or Engineer, the contractor shall leave the site in as neat, clean, and orderly condition as may be reasonably done. Where sand or gravel materials were stockpiled, the area shall be thoroughly cleaned to remove said materials.

END OF SECTION

SECTION 310021

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

The work of this section consists of the removal and disposal of fire hydrants, structures, old pavements, abandoned pipelines, and other obstructions and minor items as encountered, including salvaging of materials and backfilling of resulting trenches, holes, and pits.

1.2 JOB CONDITIONS

Do not remove culverts, and other drainage structures until arrangements have been made to accommodate traffic. Complete blasting, or other operations necessary for removal of an existing structure or obstruction, which may damage new construction, prior to placing the new work.

PART 2 - MATERIALS

Not Applicable

PART 3 - EXECUTION

3.1 GENERAL

Raze, remove, and dispose of structures, fences, and other obstructions indicated. Carefully remove designated salvageable material; transport and store in approved locations. Fill cavities left by removal to level of the surrounding ground and thoroughly compact, as directed. Directions for execution of the work will be changed and supplemented by the Engineer as necessary.

3.2 SALVAGED MATERIAL

All salvaged material is the property of the Owner. Transport and stockpile as directed by the Engineer.

3.3 WASTE MATERIAL

The Engineer will designate which items are waste material.

END OF SECTION

SECTION 310022

TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish all labor, equipment, and materials to excavate and backfill trenches for installation of pipe and appurtenances as shown on the plans or as directed by the Engineer.

1.2 QUALITY ASSURANCE

- A. The Owner's Representative shall be the final judge of suitability of all materials used in the backfill.
- B. Materials that fail to meet the requirements of the specification, whether in stockpiles or in place, shall be removed.

1.3 PROTECTION

A. Protection of Existing Improvements:

1. Protection shall be provided to prevent damage to existing improvements indicated to remain in place on the Owner's property and adjoining properties.
2. Damaged improvements shall be restored to their original condition, as acceptable to parties having jurisdiction.
3. Land areas outside the limits of permanent work performed under this Contract shall be preserved in their present condition. The Contractor shall confine his construction activities to areas defined for work on the drawings or specifically assigned by the Owner's Representative for his use.

B. Protection of Existing Utilities:

1. The Contractor shall verify all existing utility locations either shown or not shown on the drawings.
2. The Contractor shall immediately notify the Owner's Representative and applicable utility company of any damages to existing utilities.
3. Repairs to damaged utilities shall be made in accordance with the requirements of the Owner's Representative and applicable utility company at no extra cost to the Owner.

4. The Contractor shall coordinate with the Owner and the applicable utility company for shutoff of, or connection to, active utilities. Existing utility services shall not be interrupted, except as authorized in writing by the Owner's Representative.
- C. Protection of Work Site: The Contractor shall provide barricades or other type protectors necessary to warn and prevent unauthorized personnel from entering work sites.

1.4 JOB CONDITIONS

A. Classification of Excavation:

1. No classification shall be made to differentiate the various surface and subsurface conditions the Contractor may encounter during his performance under this Contract.
2. It is the Contractor's sole responsibility to verify the site surface and subsurface conditions.

B. Dewatering:

1. Trenching shall be performed in such manner that the trench and the area immediately surrounding the trench will be continually and effectively drained by gravity or temporary pumps.
2. Water shall not be permitted to accumulate in trenches.
3. Trenches shall be drained by methods which prevent the softening of the pipe bedding.

C. Shoring:

1. Shoring, including sheet piling, shall be furnished and installed as necessary to protect workers, banks, adjacent paving, structures, and utilities.
2. Shoring, bracing, and sheeting shall be removed as trenches are backfilled, in a manner to prevent caving.

- D. Blasting shall not be permitted, unless authorized in writing by the Owner's Representative.

PART 2 - MATERIALS

A. Select Soil Backfill

1. Backfill placement and material for rigid pipe shall be as described in ASTM C-12 (ANSI A106.2) or WPCF No. 9.

2. Backfill placement and material for semi-rigid pipe shall be as described in ASTM D-2680.
 3. Backfill placement and material for flexible pipe shall be as described in ASTM D-2321.
- B. Suitable material which is unsuitable due to excess moisture content will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials to the satisfaction of the Owner's Representative.
 - C. Unsuitable materials shall include those materials that are determined by the Owner's Representative to be inadequate for providing a stable backfill.
 - D. Expansive clay soils shall be classified as unsuitable unless treated or mixed in a manner approved by the Owner's Representative.

2.2 SELECTION OF BORROW MATERIAL

- A. Borrow material, if required, shall be selected to meet requirements and conditions of the particular backfill for which it is to be used.
- B. For borrow material obtained outside the limits of the project site, the Contractor shall obtain the right to procure material and shall pay all royalties and other charges involved.

PART 3 - EXECUTION

3.1 TRENCH EXCAVATION

- A. Trench excavation, regardless of material encountered, shall be performed to the depths indicated or as otherwise specified.
- B. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins.
- C. Excavated materials not required or suitable for backfill shall be removed and wasted as directed by the Owner or his authorized representative.
- D. Excavation shall be made by open cut, with as little trench opened at one time as possible.
- E. Trench walls shall be vertical from the bottom of the trench to at least one foot above the top of the pipe. The remainder of the trench shall be excavated such that the walls are at a slope flat enough to prevent collapse of the trench. Shoring shall be used as necessary to protect workers, banks, adjacent paving, structures, and utilities.
- F. Trench Width

1. Trenches shall be wide enough to allow for the proper laying of pipes and conduits. Unless otherwise indicated on the drawings or directed by the Owner's Representative, the bottom of the trench shall conform the detailed drawing on the plans.
 2. Where only a small amount of sheeting and shoring is required, which will not interfere with the work, the maximum trench widths shall be the same as where no sheeting and shoring are required.
- G. Excavation for manholes, valves, and other appurtenances shall be sufficient to allow a minimum 12 inch clearance around the appurtenance.
- H. Wet or otherwise unstable materials encountered in the bottom of the trench shall be over-excavated to allow for construction of a stable pipe bedding. The over-excavation shall be backfilled with coarse aggregate, consisting of a well-graded crushed stone, crushed gravel, or gravel having hard, strong, durable particles free of deleterious substances. The aggregate shall range in size from ¼-inch to 1-inch.
- I. If contractor over-excavates, the space below the bedding shall be filled with coarse aggregate as described in (H), above.
- J. Hand digging will be required where necessary to protect trees, shrubs, utility lines, etc.

3.2 DEPTH OF BURY

- A. Unless otherwise indicated on the Drawings or directed by the Owner's Representative, trenches shall be excavated to a depth that will provide not less than the following cover over the top of the pipe or conduit from finished grade:
1. Water Lines - 3 feet
 2. Sanitary Sewers - 3 feet
- B. In addition to the above requirements, trenches shall be excavated to a depth that will avoid interference with other utilities.

3.3 TRENCH BACKFILL

- A. General: Backfill shall not be placed until all testing has been completed to the satisfaction of the Owner's Representative.
- B. Initial Backfill
1. Select soil backfill shall be placed from the top of the haunching to six (6) inches above the top of the pipe or conduit.

2. Each lift shall not exceed six (6) inches and shall be compacted by hand. Mechanical tamping may be used except when installing plastic or fiberglass pipe or when use of mechanical tampers is not recommended by the pipe manufacturer.
 3. Initial backfill shall be placed simultaneously on both sides of the pipe to prevent displacement.
- C. Final Backfill
1. Trenches shall not be backfilled until required pressure tests are performed.
 2. Trenches shall be backfilled with select soil backfill and brought to the subgrade elevation required for surface construction or topsoiling.
 3. Backfill shall be placed in successive horizontal layers of inches to 12 inches in loose depth for the full width of the trench and lightly compacted.
 4. Rolling equipment shall not be used until a minimum of two feet of backfill material has been placed over the top of the pipe. If a hydro hammer is used to compact the backfill, a minimum of three feet of cover is required.
- D. Backfill around fire hydrants, valves, cleanouts and similar appurtenances shall conform to trench backfill requirements, except as modified on the Plans.

END OF SECTION

SECTION 310023

STRUCTURE EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 DESCRIPTION

The Contractor shall furnish all labor, equipment, and materials to excavate and backfill for structures or portions of structures located below existing grade.

1.2 QUALITY ASSURANCE

- A. Compaction of Backfill shall be in accordance with the requirements of the section "Compaction Control & Testing".
- B. The Owner's Representative shall be the sole and final judge of suitability of all materials.
- C. Materials in question, pending test results, shall not be used in the work. The Contractor shall remove all materials that fail to meet the requirements of the specifications, whether in stockpiles or in place.
- D. Backfills or subgrades which do not meet the specification requirements shall be removed or recompacted until the requirements are satisfied.

1.3 PROTECTION

- A. Protection of Existing Improvements:
 - (1) Protection shall be provided to prevent damage to existing improvements indicated to remain in place on the Owner's property and adjoining properties.
 - (2) Damaged improvements shall be restored to their original condition, as acceptable to parties having jurisdiction.
 - (3) Land areas outside the limits of permanent work performed under this contract shall be preserved in their present condition. The Contractor shall confine his construction activities to areas defined for work on the drawings or specifically assigned by the Owner's Representative for his use.
- B. Protection of Existing Utilities:
 - (1) The Contractor shall verify all existing utility locations either shown or not shown on the drawings.

- (2) The Contractor shall immediately notify the Owner's Representative and applicable utility company of any damage to existing utilities.
 - (3) Repairs to damaged utilities shall be made in accordance with the requirements of the Owner's Representative and applicable utility company at no extra cost to the Owner.
 - (4) The Contractor shall coordinate with the Owner and the applicable utility company for shut-off of, or connection to, active utilities. Existing utility services shall not be interrupted, except as authorized in writing by the Owner's Representative.
- C. Protection of Work Site. The Contractor shall provide barricades or other type protectors necessary to warn and prevent unauthorized personnel from entering work sites.

1.4 JOB CONDITIONS

A. Classification of Excavation

- (1) No classification shall be made to differentiate the various surface and subsurface conditions the Contractor may encounter during his performance under this contract.
- (2) It is the Contractor's sole responsibility to verify the site surface and subsurface conditions.
- (3) Blasting shall not be allowed.

B. Dewatering

- (1) Excavation shall be performed in such manner that the area of the site and the area immediately surrounding the site will be continually and effectively drained by gravity or temporary pumps.
- (2) Water shall not be permitted to accumulate in excavations or other areas of the site.
- (3) The excavation shall be drained by methods which prevent the softening of subgrades and backfills.

C. Shoring

- (1) Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, tanks, adjacent paving, structures and utilities.
- (2) Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

PART 2 - PRODUCTS

2.1 SUITABLE MATERIALS

- A. Suitable materials for backfill include materials that are free of debris, roots, organic or frozen materials, stones having a maximum dimension of two (2) inches in the upper six (6) inches of backfill four (4) inches in the remainder of backfill.
- B. Otherwise suitable material which is unsuitable due to excess moisture content will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration or blending with other materials to the satisfaction of the Owner's Representative.
- C. Unsuitable materials shall include those materials that are determined by the Owner's Representative to be inadequate for providing a stable backfill, subgrade or foundation for structure.
- D. Expansive clay soils shall be classified as unsuitable unless treated or mixed in a manner approved by the Owner's Representative.

2.2 FINE AGGREGATE (SAND) BACKFILL

In general, fine aggregate shall consist of natural sand having hard, strong, durable particles free from deleterious substances and meeting the following gradation requirements:

<u>Sieve</u>	<u>Mass-Percent Passing</u>
3/8 in.	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	2-10

2.3 SELECTION OF BORROW MATERIAL

- A. Borrow material, if required, shall be selected to meet requirements and conditions of the particular backfill for which it is to be used.
- B. Before borrow material obtained outside the limits of the project site, the Contractor shall obtain the right to procure material and shall pay all royalties and other charges involved.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavation, regardless of material encountered, shall conform to the dimensions and elevations indicated on the Drawings for each building and structure, and shall include trenching for utility and foundation drainage systems to a point five (5) feet beyond the building line of each building and/or structure.
- B. Before excavation is started, areas in which excavation is to be performed shall be cleared and grubbed.
- C. Excavation shall extend a sufficient distance from walls and footings to allow for lacing and removal of forms, installation of services, and for inspection, except where the concrete for walls and footings is authorized by the Owner's Representative to be deposited directly against excavated surfaces.
- D. Suitable excavated material shall be transported to and placed to fill excavated areas within the limits of the work.
- E. Unsuitable materials encountered within the limits of the work shall be excavated below grade and replaced with suitable materials as directed by the Owner's Representative, except that concrete footings shall be increased in thickness to the bottom of the over-depth excavations and over-break in rock excavation.
- F. Excavation to final grade shall not be made until just before concrete is to be placed.
- G. Waste Material:
 - (1) No excavated material shall be wasted without the authorization of the Owner's Representative.
 - (2) Surplus excavated material and unsuitable material shall be disposed of by the Contractor at his own expense and responsibility in the waste area shown on the Drawings, or as directed by the Owner's Representative.
 - (3) Material authorized to be wasted shall be disposed of in such manner as not to obstruct the flow characteristics of any stream or to impair the efficiency or appearance of any structure.
- H. No excavated material shall be deposited in a manner that may endanger a partly finished structure by direct pressure or by overloading banks contiguous to the operations, or that may otherwise be detrimental to the completed work.

3.2 BACKFILL

- A. Backfills shall conform to the dimensions and elevations indicated on the Drawings for each building and structure.
- B. Placing Backfill:

- (1) Suitable material shall be placed in successive, horizontal, uniformly spread layers of loose material not more than six (6) inches thick, except that in areas not accessible or permitted for the use of self-propelled roller or vibrators, the loose layer shall be four (4) inches thick.
- (2) Backfills shall not be placed in wet or frozen areas.
- (3) Backfill shall not begin until construction below finish grade has been completed, underground utility systems have been inspected and tested, forms removed, and the excavation cleaned of trash and debris.
- (4) Fine aggregate backfill shall be placed to the dimensions and elevations indicated on the drawings.
- (5) Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted by power-driven hand tampers suitable for the material being compacted.
- (6) Backfill shall be placed carefully around pipes to avoid damage to coatings.
- (7) Backfill shall not be placed against foundation walls prior to 7 days after placement of the walls.
- (8) As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.
- (9) When fill or backfill is to be placed and compacted against structure walls, the walls shall be supported laterally as necessary to prevent damaging or displacing the walls. Any wall so damaged as a result of the Contractor's operation shall be completely and promptly replaced.
- (10) When backfill is placed under concrete slabs, only fine aggregate (sand) backfill shall be used, as described in this specification, to within four inches of the bottom of the slab. The top four inches under all slabs shall be gravel, $\frac{3}{4}$ " to $1\frac{1}{2}$ " crushed limestone or similar material.

3.4 COMPACTION

- A. Allow sufficient time for all necessary compaction tests.
- B. Compaction shall be accomplished by sheep's-foot rollers, pneumatic-tired rollers, steel-wheeled rollers, or power-driven hand tampers well suited to the soil being compacted. Material shall be aerated or moistened to maintain the required moisture content.
- C. Fine aggregate backfill shall be compacted with a minimum of two (2) passes of a power driven hand tamper.

3.5 FINISH GRADING

- A. Excavated and filled sections, and adjacent transition areas, shall be uniformly smoothly graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes.
- B. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified.
- C. The surface of fills or excavated areas for slabs-on-grade shall not vary more than 0.05 foot from the established grade.
- D. Other finished surfaces shall not vary more than 0.15 foot from the established grade and cross section and shall be free of depressed areas where water would pond.

3.6 SEEDING

All backfill areas and other areas disturbed by the project shall be seeded in accordance with requirements detailed in the section "Seeding".

END OF SECTION

SECTION 310024

SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

The contractor shall furnish all labor, materials, and equipment to seed areas shown on the plans and/or the requirements of other specifications.

1.2 DELIVERY, STORAGE AND HANDLING

Deliver grass seed and fertilizer on wood pallets. Damaged packages are not acceptable. Packages for seed and fertilizer shall be waterproof.

PART 2 - MATERIALS

2.1 SEED

The type of seed shall be as indicated on the plans or directed by the Engineer.

Seed shall be furnished in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each seed.

2.2 LIME

When specified or directed by the Engineer, lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve.

Dolomite lime or high magnesium lime shall contain at least 10% of magnesium oxide.

2.3 FERTILIZER

Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the following percentages:

Nitrogen	30%
----------	-----

Phosphorous	70%
-------------	-----

The fertilizer shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon.

2.4 SOIL FOR REPAIRS

The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf.

2.5 MULCH

When required or directed by the Engineer, mulch shall consist of clean straw and natural mulch consisting of brush and vegetation previously chipped and stockpiled.

PART 3 - EXECUTION

3.1 PREPARATION

After rough grading has been completed, areas to be seeded shall be cleared of stones larger than 2-inches in any diameter, sticks, stumps, and other debris which might interfere with sowing seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after completion of rough grading and before seeding operations begin, the contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

After shaping the areas to the required final grade, the top 3-inches of soil shall be worked into a satisfactory seedbed by disc, or cultipackers, or drags, or harrows, or other appropriate means.

3.2 APPLICATION

- A. General: Application of lime (if required) fertilizer, and seed shall be by the dry or wet method as described herein.
- B. Dry Method
 - (1) Liming: Lime shall be applied separately and prior to the application of any fertilizer or seed. The lime shall be worked into the top 3-inches of soil.
 - (2) Fertilizing: After liming, the fertilizer shall be uniformly spread at the rate specified by the manufacturer.
 - (3) Seeding: Immediately after fertilizing, spread grass seed at the rate specified by the manufacturer. After application, cover seed ½" to 1" with soil by means of chain harrow or hand-rake.
 - (4) Rolling: After the seed has been placed, the seedbed shall be immediately compacted by means of an approved lawnroller weighing 40 to 65 pounds per foot of width for clayey soils and 150 to 200 pounds per foot of width for sandy or sandy-clayey soils.

- (5) Mulching: After rolling, spread natural mulch evenly. Augment with straw mulch to a uniform depth of 2-inches. On slopes greater than 3:1, secure mulch in place by use of jute mesh, or bio-degradable fabric.

C. WET METHOD

- (1) Equipment: The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments no larger than 50 gallons over the entire range of tank capacity, mounted so as to be visible to the operator. The tank shall be equipped with a mechanical power driven agitator capable of keeping all solids in the mixture in complete suspension at all times until used. The pump shall deliver 100 gallons per minute at 100 psi. The pump shall be mounted in a line which will recirculate the mixture through the tank whenever it is not being sprayed through the nozzle. All pump passages and pipe lines shall be capable of providing clearance for $\frac{3}{4}$ inch solids. All controls shall be mounted to be accessible to the nozzle operator.

At least three different nozzles shall be furnished to properly spray over distances varying from 20 feet to 100 feet. A 50 feet length of extension hose shall be provided to reach inaccessible areas.

- (2) Mixtures: Lime, when required, shall be applied separately, prior to the fertilizing and seeding operations. Unless otherwise specified by the plans or by the Engineer, 220 pounds of lime shall be added to and mixed with each 10 gallons of water.

Seed and fertilizer shall be mixed together prior to application. Unless otherwise specified by the plans or by the Engineer, the seed and fertilizer shall be mixed in the relative proportions specified by the manufacturer. 220 pounds of this mixture shall be added to and mixed with each 100 gallons of water.

All water shall be furnished by the Owner. It shall be from fresh water sources and free from injurious chemicals and other toxic substances harmful to plant life.

- (3) Spraying: Particular care shall be exercised to insure that application is made uniformly and at the prescribed rate. The nozzle operator shall guard against misses and overlapped areas.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test pans over the area. The mixture shall fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in a manner that will produce erosion or runoff.

After the soil has dried, raking and rolling operations will be required after the soil has dried. If mulch is required, raking and rolling operations will not be required.

- (4) Mulching: Mulching, when required, shall meet requirements detailed in Section 3.2(B)(5) of this specification.

D. MAINTENANCE OF SEEDED AREAS

The contractor shall protect seeded areas against traffic or other use by installing or erecting warning signs or barricades, as approved by the engineer or detailed on the plans. Surfaces damaged by erosion shall be regraded and reseeded. The contractor shall mow, water, and maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

E. TIMING

Seed only in the fall or when approved by the Engineer.

END OF SECTION

SECTION 310025

EMBANKMENT, PLACING AND COMPACTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The contractor shall furnish all labor, equipment, and materials to construct a permanent fill above existing grade in accordance with the contract drawings and these specifications.

1.2 QUALITY ASSURANCE

- A. The Owner's Representative shall be the sole and final judge of suitability of all materials.
- B. Materials in question, pending test results, shall not be used in the work. The contractor shall remove all materials that fail to meet the requirements of the specifications, whether in stockpiles or in place.

1.3 PROTECTION

A. Existing Improvements:

1. Protection shall be provided to prevent damage to existing improvements indicated to remain in place on the Owner's property and adjoining properties.
2. Damaged improvements shall be restored to their original condition, as acceptable to parties having jurisdiction.
3. Land areas outside the limits of permanent work performed under this contract shall be preserved in their present condition. The contractor shall confine his construction activities to areas defined for work on the drawings or specifically assigned by the Owner's Representative for his use.

B. Existing Utilities:

1. The contractor shall verify all existing utility locations either shown or not shown on the plans before starting construction.
2. The contractor shall immediately notify the Owner's Representative and applicable utility company of any damages to existing utilities.
3. Repairs to damaged utilities shall be made in accordance with the requirements of the Owner's representative and applicable utility company at no extra cost to the owner.

4. The contractor shall coordinate with the Owner and the applicable utility company for shut-off of, or connection to, active utilities. Existing utility services shall not be interrupted.
- C. Protection of Work Site: The contractor shall provide barricades or other type protectors necessary to warn and prevent unauthorized personnel from entering the work site.

1.4 JOB CONDITIONS

- A. It is the contractor's sole responsibility to verify the site surface conditions.
- B. The area of the site and areas immediately around the site will be continually and effectively drained by gravity or temporary pumps.

PART 2 - MATERIALS

2.1 SUITABLE MATERIALS

- A. Suitable materials for fill shall include materials that are free of debris, roots, organic or frozen materials, stones having a maximum dimension of two inches in the top 12-inches of fill, and four-inches in the remainder of fill.
- B. Otherwise suitable material which is unsuitable due to excess moisture content will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration or blending with other materials to the satisfaction of the Owner's Representative.
- C. Unsuitable materials shall include those materials that are determined by the Owner's Representative to be inadequate for providing a stable permanent fill.
- D. Expansive clay soils shall be classified as unsuitable unless treated or mixed in a manner approved by the Owner's Representative.
- E. All materials for permanent fill shall be secured from designated borrow areas, or when approved by the Owner's Representative, from required excavation.

2.2 BORROW AREAS

- A. For material obtained from areas outside the limits of the project site, the Contractor shall secure the right to procure material and shall pay all royalties and other charges involved.
- B. Borrow areas shall be selected by the Contractor to meet requirements and conditions of the particular fill for which it is to be used. The selected fill material shall be approved by the Engineer prior to use.

PART 3 - EXECUTION

3.1 PREPARATION OF GROUND SURFACE FOR FILL

- A. Areas upon which fills are to be placed shall be cleared and grubbed before the fill is started. See the Section "Structure Excavation and Backfill" for requirements. All holes shall be filled with approved material from the borrow areas or from required excavation. The methods of placement and compaction of this fill material shall be as specified herein for permanent fill, supplemented if and where necessary, by hand or power tampers in areas not readily accessible to other compacting equipment.
- B. After filling holes as specified above, the ground upon which the permanent fill shall be placed shall be thoroughly broken and turned to a depth of six-inches, roughly leveled, the moisture content adjusted to near optimum conditions, and then compacted by rolling with a vibratory roller to 95% Standard Density. Areas which do not meet the density requirements shall be thoroughly broken, and compacted at no additional cost.
- C. When the ground is part of a fill area, the top 12-inches shall be broken and compacted after roughly leveling the surface.
- D. All preparation of ground surfaces shall be completed in advance of the first layer or lift of the permanent fill.

3.2 PLACING PERMANENT FILL

- A. The permanent fill shall conform to the dimensions and elevations indicated on the drawings.
- B. Suitable material shall be placed in successive, horizontal, uniformly spread layers of loose material not more than six (6) inches thick, and compacted to 95% Standard Density.
- C. Each layer or lift shall extend at an approximately uniform elevation over the entire width of the cross section and the entire length of the permanent fill unless notified in writing by the Owner's Representative that the construction in sections is permitted. When operations are not continuous, the ends of each section shall be left sloped to not steeper than one on six.
- D. Fill material shall not be placed on wet or frozen areas.
- E. Compaction shall be performed by sheep's-foot rollers, pneumatic-tired rollers, steel-wheeled rollers, or power driven hand tampers well suited to the soil being compacted.
- F. If in the opinion of the Owner's Representative the rolled surface is too smooth to bond properly with the succeeding layer or adjacent section, it shall be loosened by scarifying or dicing to the satisfaction of the Owner's Representative before the succeeding layer or adjacent section is placed.

3.3 PLACING TOPSOIL

- A. As the construction of the permanent fill proceeds, topsoil shall be placed on the outer portion of the fill, to a minimum depth of six (6) inches, in successive layers so as to provide a bond with the adjacent section of embankment.
- B. Topsoil shall be ridged or diked on the embankment slopes with any type of equipment which will give the desired results.
- C. After placement, the topsoil material is not to be compacted, but shall be finished to true line and grade in such manner that seeding, sodding, or planting can proceed upon completion of placing the fill material.
- D. Topsoil shall not be placed in areas that will be paved.

END OF SECTION

SECTION 310026

COMPACTION CONTROL AND TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The contractor shall furnish all labor, materials, and equipment to perform all laboratory and field test required for compaction control of soils.

1.2 DEFINITIONS

A. Cohesionless Materials:

- 1. Cohesionless materials shall be clean, free-draining, variously-graded gravels and sands with little or no fines. The portion passing the No. 200 sieve shall be limited to 12% and shall have a plasticity index of 0.
- 2. Cohesionless materials shall be classified according to ASTM D 2487 as GW, GP, SW or SP.

B. Cohesive Materials:

- 1. Cohesive materials shall be classified according to ASTM D 2487 as GM, GC, SM, SC, CL and CH.
- 2. Materials classified according to ASTM D 2487 as ML, OL, MH, OH and PT shall be unsatisfactory unless treated or mixed in a manner approved by the Owner's Representative.

1.3 QUALITY ASSURANCE

A. Test Specifications:

1. Laboratory Tests:

- a. Moisture - density relations of soils (compaction test)-AASHTO T 99, Method C or D;
- b. Liquid limit of soils - AASHTO T 89;
- c. Plastic limit and plasticity index of soils - AASHTO T 90; and
- d. Particle size analysis of soils (graduation test)- AASHTO T 88.

2. Field Tests:

- a. Density of soil in-place by the rubber-balloon method AASHTO T 205;
- b. Determination of moisture in soils by means of a calcium carbide gas pressure moisture tester - AASHTO T 217; and
- c. Density of soil and soil aggregate in-place by nuclear methods - AASHTO T 238, Method B (direct transmission).

B. Laboratory Tests Required:

1. The following tests shall be performed for each principal type of material or combination of materials encountered or utilized.
 - a. Compaction test;
 - b. Liquid Limit test;
 - c. Plastic limit test (and determination of plasticity index); and
 - d. Gradation test.
2. The tests listed above shall be performed on additional samples as directed by the Owner's Representative.
3. Results of these tests shall be the basis of control for compaction.

C. Field Tests Required:

1. Structure Excavation and Backfilling:
 - a. One (1) in-place density test and one (1) in-place moisture test per lift, but no more than 10 tests per lift; and
 - b. One (1) in-place density test and one (1) in-place moisture test per lift in subareas enclosed by interior grade stems or interior stem walls prior to placement of fill, but not less than one (1) test per lift.
2. Trench Excavation and Backfilling:
 - a. One (1) in-place density test and one (1) in-place moisture test per 100 linear feet of trench per lift under structures and paved areas; and
 - b. One (1) in-place density test and one (1) in-place moisture test per 300 linear feet of trench per lift under grassed or non-traffic areas.
3. Embankments:

- a. One (1) in-place density test and one (1) in-place moisture test per 1000 square yards per lift.
 - b. For construction of dikes, one (1) in-place density test and one (1) in-place moisture test per 50 lineal feet per lift or 1000 square yards or lift, whichever is less.
4. Excavation, filling and raw subgrade preparation under paved areas: One (1) in-place density test and one (1) in-place moisture test per 2,000 square yards per lift;
 5. Excavation, filling and raw subgrade preparation under grassed or non-traffic areas: One (1) in-place density test and one (1) in-place moisture test per 3,000 square yards per lift;
 6. Nuclear methods for determining in-place density may be used for only 80% of the required tests. The remaining tests shall be correlation check tests of the nuclear test results by use of the rubber-balloon method; and
 7. Additional in-place moisture-density tests and relative density tests shall be performed as directed by the Owner's Representative.
- D. Samples for laboratory and field tests shall be taken at locations designated by the Owner's Representative.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

- A. Each lift shall be compacted to not less than the percentage of maximum density specified below:

Fill Embankment, Backfill, and Trench Backfill	Percent Maximum Density	
	Cohesive Material	Cohesionless Material
Subgrade Under Equipment Slabs, Buildings Slabs-on-Grade and Other Structures, Top Twelve Inches	100	105
Under Pavement, Driveways, Curbs, Gutters, Steps, and Similar Use Areas, Top Twelve Inches	95	100

Under Sidewalks and Similar Use Areas, Top Six Inches	90	95
---	----	----

B. Moisture Content:

1. Each lift of fill, embankment, backfill and trench backfill under pavement, driveways, curbs, gutters, stems, sidewalks, grassed or landscaped areas, and similar use areas (including adjacent shoulder areas) shall be compacted at a moisture content one (1) percent below to four (4) percent above optimum moisture.
2. Each lift of fill, embankment, backfill and trench backfill under equipment slabs, building slabs-on-grade, and other structures shall be compacted at a moisture content one (1) to three (3) percent above optimum moisture.
3. Subgrades shall be compacted at a moisture content one (1) to three (3) percent above optimum moisture.

3.2 COMPACTION DEFICIENCIES

- A. The Owner's Representative shall be the final judge of suitability of all compaction.
- B. Apparent negligence or carelessness during any portion of the earthwork operations will require that additional tests be performed on that portion of the work.
- C. Fills, embankments, backfills, trench backfills or Subgrades that do not meet the specification requirements shall be removed or recompacted until the requirements are satisfied.

END OF SECTION

SECTION 310027

CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

The Contractor shall furnish all labor, equipment, and materials to complete all concrete work and related items indicated on the drawings and described in these specifications.

1.2 SHOP DRAWINGS

- A. Submit five (5) copies of shop drawings for reinforcing steel to Engineer for approval. Obtain approval of drawings prior to fabricating any material or proceeding with the work.
- B. Shop drawings for reinforcing steel shall indicate bending diagrams; assemble diagrams; splicing and laps of rods; shapes, dimension and details of bar reinforcing and accessories. Drawings shall be prepared in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315. Scaled dimensions from structural drawings shall not be used in determining the lengths of reinforcing rods.

1.3 QUALITY ASSURANCE

- A. The Engineer shall have access to and the right to inspect all batch plants, cement mills, and supply facilities of suppliers, manufacturers, subcontractors, and contractors providing products included in these Specifications.
- B. Batch plant equipment shall be either semi-automatic or fully automatic.
- C. Concrete samples for field control shall be as follows:
 - (1) Slump per ASTM C143 (2) Test cylinders per ASTM C31 and C39Samples shall be collected at the following locations:
 - (1) Pumped Concrete; at the discharge end of the line.
 - (2) Ready-mix; at the discharge and of the chute.
 - (3) Job-Site Mixing;

PART 2 - MATERIALS

- 2.1 Portland Cement: ASTM C150-60, Type I.

- 2.2 Fine Aggregate: Clean hard natural sand, or manufactured sand, or a combination of both and conforming to ASTM C33-59.
- 2.3 Coarse Aggregate: Except as otherwise specified, aggregate shall be hard, durable, uncoated crushed stone, conforming to ASTM C33-61T.
- A. Maximum size aggregate allowed is $1/5$ of narrowest dimensions between top of slab and forms or between forms of the concrete member or $3/4$ of minimum clear spacing between reinforcing bars, or as recommended in ACI Standard No. 613-54.
- B. For concrete having an exterior surface exposed, 95 to 100% shall pass a $1\frac{1}{2}$ inch sieve; 35 to 70% shall pass a $3/4$ inch sieve; 10 to 30% shall pass a $3/8$ inch sieve and over 5% shall pass a No. 4 sieve. Percentages are by weight.
- 2.4 Mixing Water: Clean and free from oil, acid and injurious amounts of vegetable matter, alkalies and other impurities.
- 2.5 Metal Reinforcement: Reinforcing steel shall meet the following specifications:
- A. Reinforcing Bars: Bars shall be deformed in accordance with ASTM A305-56T or ASTM A408-58T and formed of either grade 40 A615 billet or grade 50 A616 rail steel. Reinforcement shall be clear and free from loose rust, scale or other coatings that will reduce bond.
- B. Welded Wire Fabric Reinforcing: (ASTM A 185-61T) Steel wire spot-welded at intersections and of size indicated. Where size is not noted it shall be 6 x 6 inch mesh, No. 10 gauge. Use wire reinforcing in all concrete slabs and elsewhere indicated.
- 2.6 Metal Accessories: Include all spacers, chairs, bolsters, ties, and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place. Accessories shall conform to requirements of the Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice for Reinforced Concrete Construction".
- 2.7 Expansion Joint Fillers: Asphalt impregnated fiberboard conforming to ASTM D 1751-601 for interior work and self expanding cork board conforming to ASTM D 1752-60T for exterior work. Joint fillers shall extend full depth of slab or joint and be of thickness and lengths indicated on drawings. Remove top $3/4$ inch and fill with Joint Seal.
- 2.8 Joint Seal: Furnish and install DURASEAL-U traffic grade two-component polyurethane sealant as manufactured by Grace or approved equal for all construction, contracting and expansion joints in concrete slabs and for joints between concrete and masonry. Install in strict accordance with the manufacturers printed instructions.
- 2.9 Non-Shrinking Cement Grout: Cement grout for bedding plates to receive heavy equipment, column bases, and for other locations noted on the drawings shall be non-shrinking grout. The mix and setting characteristics shall be as recommended by the manufacturer for the purpose intended. Mix and place in strict accordance with the manufacturer's instructions.

2.10 Admixtures

- A. All concrete shall have air-entraining admixture conforming to ASTM C260, except that it shall be nontoxic after 30 days and shall contain no chlorides.
- B. Pozzolan shall be used in combination with cement for all hydraulic and below grade structures. The pozzolan shall be Class C or Class F fly ash conforming to ASTM C618.
- C. Water-reducing admixtures shall conform to ASTM C494, Type A.

2.11 Form Material

- A. Form surfaces for exposed surfaces shall be in new and undamaged condition and may be plywood, hard plastic finished plywood, or steel of sufficient strength and surface smoothness to produce the specified finish.
- B. All joints in forms shall be taped, gasketed, plugged, and/or caulked with an approval material so that Joints will remain watertight and withstand placing pressures without bulging outward or creating surface patterns.
- C. Form surfaces that have been damaged may be used for non-exposed surfaces, or where finish is of no real concern as determined by the Engineer.
- D. Positive spacers shall be provided for all wall forms.

2.12 Bonding Agent:

2.13 Concrete Strength: Concrete shall have the minimum compressive strength at 28 days as shown below for various features unless otherwise directed by the Engineer.

<u>Feature</u>	<u>Strength (PSI)</u>
Columns and beams	3,500
Footings and piers	3,500
Floor slabs (structural)	3,500
Floor slabs (on grade)	3,500
Retaining Walls	3,500
Paving	3,000
Sidewalks	2,500
Thrust blocking	2,500
Valve and pipe supports in vaults or buildings	3,000

Valve and pipe supports in trenches	2,500
Manholes	3,500
Vaults	3,500
Box culverts	3,500
Pump bases	3,500
Pipe headwalls and storm drain structures	3,000
Pipe piers (less than 6 feet high)	3,500
Pipe piers (6 feet and above)	4,000

2.14 Mixing Concrete

- A. Ready-Mixed Concrete. Ready-mixed concrete shall be mixed and delivered to the project in accordance with ASTM specifications C 94-61, using alternate No. 1 or No. 2 as applicable to the responsibility specified for the mix design. In addition the ready-mixed concrete producer shall furnish duplicate delivery tickets with each load of concrete delivered to the project.

The delivery tickets shall indicate the delivery date and time dispatched; name and location of project; name of contractor; name of ready mixed concrete producer; truck number; number of cubic yards of cement in load, class of concrete; the cement content in bags per cubic yard of concrete; type and brand name of cement; admixtures in concrete, if any; maximum size of aggregate and the amount of water added at job, if any.

- B. Hand Mixing: Hand mixing of concrete will be permitted only for small placements or in the case of emergency, and then only on the authorization of the Engineer. When hand mixing is permitted, it shall be done on a watertight platform. The fine aggregate and cement shall first be mixed until a uniform color is attained and then spread over the mixing board in a thin layer. The coarse aggregate shall be thoroughly saturated with water, and it shall be spread over the fine aggregate and cement in a uniform layer and the whole mass turned as the additional water is added. After all ingredients have been added, the mass shall be turned at least six times, or more, to make the mixture uniform in color and smooth in appearance. Hand mixed batches shall not exceed a two-bag batch in volume.
- C. Job-Site Mixing: If mixed on site, equipment shall include suitable charging hopper and water measuring facilities. Concrete will be mixed until homogenous, and each batch mixed will be completely discharged prior to mixing the next batch in the drum.

PART 3 - EXECUTION

- 3.1 Construction of Forms: Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement and to safely support construction loads. Provide access opening for cleaning and inspecting forms and reinforcing prior to depositing concrete. Do not coat forms with material that will stain or cause injury to exposed concrete surfaces or to plaster applied direct to concrete. Keep wood forms wet as necessary to prevent shrinkage. Forms for exposed, concrete beams, girders, columns and pilasters shall provide for a 1 inch radius or flat bevel on external corners. Construct forms for beams, girders and lintels so that sides may be removed without disturbing bottom of form or its support. All grade beams shall have side forms.
- 3.2 Form Surface Preparation: All form, surfaces in contact with the concrete shall be thoroughly cleaned of all previous concrete, dirt, and other surface contaminants prior to placement.
- 3.3 Inserts and Fastening Devices for Other Work
- A. Provide for installation of inserts, conduit, pipe sleeves, drains, hangers, metal ties, shelf angle supports, anchors, bolts, angle guards, dowels, thimbles, anchor slots, metal ringlets, nailing strips, blocking, grounds and other fastening device required for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured. Where openings are left in concrete for the passage of ducts, the openings shall be made slightly larger than the duct size as directed by the Engineer. Where boxes are required for floor type door closures and electrical work they shall be accurately located and where required the slab shall be cut-out to receive the boxes prior to placing the cement floor topping. All boxes shall have a minimum of 3 inches of reinforced concrete under bottom of box. Do not install sleeves in any concrete beam, joist or column except after approval of the Engineer.
- B. Sufficient time between erection of forms and placing of concrete shall be given to the various trades to permit the proper installation of their work. See drawings and other sections of the specifications for extent, location and details of items to be embedded or placed in concrete.
- C. All sleeves, chases, inserts, hangers etc. which are provided and placed in the forms by the various trades shall be maintained in position and protected until the concreting is completed. Hangers where required shall be anchored to the main reinforcing bars.
- 3.4 CONSTRUCTION JOINTS
- A. Construction joints shall be formed as indicated on the drawings, or as approved or directed by the Engineer. Dowels and keys shall be used where indicated or required.
- B. The rate and method of placing concrete and the arrangement of construction joint bulkheads shall be such that the concrete between construction joints shall be placed in a continuous operation.

- C. Joints in reinforced slabs and beams shall be perpendicular to the axis or surface of the member jointed and at that point, the joint shall be located at the point of minimum shear.

3.5 DEPOSITING CONCRETE

- A. Preparation: Before placing concrete, all debris, water and ice shall be removed from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted (except in freezing weather) or oiled, and the reinforcement cleaned of ice or other coatings. Formwork and the placement of reinforcement, pipes, sleeves, conduit, hangers, anchors and other inserts shall be inspected and approved by the Engineer before any concrete is deposited.
- B. Placing: The placing or depositing of all concrete shall be done in accordance with requirements of The American Concrete Institute Building Code and as modified herein. Concrete shall be rapidly handled from mixer to forms and deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Concrete shall be spaded and worked by hand and vibrated to assure close contact with all surfaces of forms and reinforcement and leveled off at proper grade to receive finish. All concrete shall be placed upon clean, well-thawed, damp surfaces, free from water, and never upon soft mud or dry porous earth. Concrete in bearing walls and columns shall be placed and allowed to settle two hours before placing concrete superimposed thereon. Aluminum pipe or other aluminum conveying devices will not be permitted.
- C. Vibration: Concrete shall be placed with the aid of mechanical vibrating equipment. Vibration shall be applied directly to the concrete unless otherwise approved by the Engineer. The intensity of vibration shall be sufficient to cause flow or settlement of the concrete into place.

Vibration shall be applied at the point of deposit and in the area of freshly placed concrete. It shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures, but shall not be long enough to cause segregation of the mix. To secure even and dense surfaces, free from aggregate pockets or honeycomb, vibration shall be supplemented by hand spading in the corners and angles of forms and along form surfaces while the concrete is plastic under the vibratory action. Caution must be exercised when using vibrators and hand spades to prevent any injury to the inside face of the forms or any movement of the reinforcement.

- D. Hot Weather Placement: Every effort shall be made to maintain a concrete temperature below 90 degrees F at time of placement. Ingredients may be cooled before mixing to prevent excessive concrete temperature.

Provisions shall be made for windbreaks, shading, fog spraying, sprinkling, or wet cover, when necessary.

Water-reducing and/or set-retarding admixtures shall be used in such quantities as especially recommended by the manufacturer to assure that the concrete is workable.

- E. Cold Weather Placement: Concrete shall not be placed when the ambient temperature is below 40 degrees F, or approaching 40 degrees F and falling. Concrete shall not be placed against frozen earth or ice, or against forms and reinforcement with frost or ice present.

Concrete placed shall be cured and protected for a minimum of 7 consecutive calendar days.

3.6 CONCRETE CONTROL TESTS

- A. Make test cylinders from concrete as mixed and at the direction of the Engineer. A minimum of six test cylinders shall be made for footings, six for grade beams and six for concrete floor; more or less tests may be made if ordered by the Engineer.
- B. Test specimen shall be taken by the Engineer and tested by an approved laboratory at Contractor's expense and in accordance with ASTM Specifications for "Compression Tests of Concrete". Results of tests shall immediately be submitted to the Engineer.
- C. Where results of strength tests indicate that concrete in place does not meet specification requirements or there is evidence that quality of concrete is below specification requirements, samples of concrete shall be obtained and tested in accordance with ASTM C 42 at the Contractor's expense. Where test results indicate that in-place concrete does not meet specification requirements, measures as prescribed by the Engineer shall be taken to correct the deficiency, at no additional expense to the Owner. Furnish four (4) copies of results of each test to the Engineer.
- D. During cold weather placement, test cylinders shall be protected from temperatures below 40 degrees F for seven consecutive calendar days.
- E. During hot weather placement, test cylinders shall be wrapped in wet burlap bags during the first 24 hours of curing, thence under water for 6 consecutive days.

3.7 PROTECTION AND CURING

- A. Protect concrete against frost and rapid drying and keep moist for at least six (6) days after placing; during this period, concrete shall be maintained above 70 degrees F for at least three (3) days or be 50 degrees F for at least five (5) days. Concrete from which forms are removed within six (6) days after concreting, and cement finishes shall be sprayed during the curing period as frequently as drying conditions may require. Cover cement finishes with mats, waterproof paper or other approved membrane within 24 hours after finishing and maintain in good condition until directed.
- B. The methods and recommended practice as described in ACI Standard 604-56 shall be followed for winter concreting and ACI Standard 605-59 shall be followed for hot weather concreting.

- C. Admixtures intended to accelerate the hardening of the concrete or to produce higher than normal strength at early periods will not be permitted unless specified or prior approval is obtained from the Engineer.
- D. The use of salt, chemicals or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.
- E. Records shall be kept by the Contractor to show the date of placements, the mix used and the air temperature at time of concreting for the various portions of the work. These records shall be available to the Engineer when requested.

3.8 REMOVAL OF FORMS

- A. Forms shall be removed in accordance with requirements of the ACI Building Code Requirements for Reinforced Concrete No. 318-56, Chapter 5, without damage to concrete and in a manner to insure complete safety of the structure. Leave shoring in place until concrete member will safely support its own weight plus any live loads that may be placed upon it.
- B. Upon removal of forms, the Engineer shall be notified by the Contractor in order that an inspection of the newly stripped surfaces may be made prior to patching.
- C. Freshly stripped surfaces shall not be pointed up or touched in any manner before having been inspected by the Engineer.
- D. Forms for elevated structural slabs or beams shall remain in place until the concrete has reached the specified 28-day compressive strength as determined by test cylinders.

3.9 BACKFILL AGAINST WALLS

- A. Do not place backfill against walls until concrete has obtained 28-day compressive strength as determined by test cylinder.
- B. Where backfill is to be placed on both sides of the wall, the backfill shall be placed simultaneously on both sides to prevent differential pressures.

3.10 PUMPING OF CONCRETE

- A. Pumping of concrete will be permitted only with the Engineer's approval.
- B. The Contractor shall have adequate equipment on site during pumping to provide redundancy to insure completion of the concrete placement without cold joints in the event of breakdown of primary placing equipment.
- C. The minimum hose diameter shall be 4 inches.

3.11 BONDING TO OLD CONCRETE: Coat the contact surfaces with bonding agent. The method of preparation and application shall be in strict accordance with manufacturer's instructions.

END OF SECTION

SECTION 310028
CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor shall furnish all labor, materials, and equipment to construct concrete paving for walks, roads, parking areas, and curbs and/or gutters in accordance with these specifications and to the dimensions and typical cross sections shown on the Plans.

1.2 WORK INCLUDED

The work shall include the following general requirements:

- A. Clear right-of-way, as required.
- B. Prepare subgrade including excavation and embankment.
- C. Install or construct drainage structures.
- D. Place concrete slab.
- E. Cleanup and restore right-of-way.
- F. Paint lines and markings where required.

1.3 QUALITY ASSURANCE

The reference Standards listed below shall be used as needed during the performance of this contract.

- A. ASTM C150 - Portland Cement.
- B. ASTM C94 - Ready-Mixed Concrete.
- C. ASTM C260 - Air-Entraining Admixtures for Concrete.
- D. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- E. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- F. ASTM C33 - Concrete Aggregates.
- G. ASTM D1190 - Concrete Joint & Sealer, Hot-Poured Elastic Type.

- A. Wood forms shall have a minimum size of 2" x 6".
- B. Metal forms shall have a minimum thickness of 7/32-inch and furnished in sections not less than 10 feet. Forms shall have the depth equal to the prescribed edge thickness of the concrete.
- C. Accessories shall be provided to insure matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearances of concrete.

2.3 REINFORCEMENT

- A. All road slabs shall be reinforced with a single layer of welded wire fabric, deformed, ASTM A185, 8 x 8 - D10 x D10, or #4 bars on 8-inch centers, new billet, deformed, ASTM A615, with 40 ksi yield strength.
- B. All sidewalk paving shall be reinforced with a single layer of welded wire fabric, deformed, ASTM A185, 6 x 6 - D6 x D6, or #3 bars on 6-inch centers, new billet, deformed, ASTM A615, with 40 ksi yield strength.
- C. Reinforcing steel for expansion joints shall consist of #4 bars, new billet, ASTM A615, plain, with 60 ksi yield strength.
- D. Reinforcing steel for curb and gutter shall be #4 bars, new billet, deformed, ASTM A615, with 40 ksi yield strength.

2.4 ACCESSORIES

- A. Expansion joint filler shall be asphalt impregnated fiberboard meeting the requirements of ASTM D1751. Minimum thickness shall be as follows:

<u>Location</u>	<u>Thickness</u>
Road or Street Paving	3/4-inch
Walks	1/2-inch
Curb & Gutter	3/4-inch

Joint filler shall extend full-depth for all concrete paving.

- B. Sealant shall be hot-poured polymer based asphalt compound per ASTM D1190.
- C. Concrete curing compound shall be chlorinated rubber type, clear color, type 1, Class B, per ASTM C309.

2.5 CONCRETE MIX

- A. Concrete shall be mixed and proportion to produce a minimum strength of 3500 psi at 28 days.
- B. Air entrainment shall be 4 to 6 percent.
- C. Maximum slump shall be 4-inches.
- D. Accelerating admixtures may be used in cold weather when approved by the Engineer. Set-retarding admixtures may be used during hot weather only when approved by the Engineer.

2.6 SAND MODIFIED SUBGRADE

- A. Sand. The sand shall consist of fine, granular, silicious material with less than 10% passing the 200 sieve and 100% passing the No. 4 sieve. It shall have a P.I. less than 10.
- B. Water. Water for subgrade modification shall be clean and free from sewage, oil, acid, strong alkalies, or vegetable matter.

PART 3 - EXECUTION

3.1 SAND MODIFIED SUBGRADE:

- A. Mixing of sand and soil shall not take place when the weather is foggy or rainy, or when the subgrade is frozen.
- B. Mixing shall not take place when temperature is below 35 degrees Fahrenheit, or when conditions indicate that the temperature may fall below 35 degrees Fahrenheit within 24 hours.
- C. After clearing and grubbing, place a 2-inch thick layer of sand on areas to be covered by concrete. The subgrade shall then be scarified to a minimum depth of 6-inches.
- D. Immediately after the sand and soil have been mixed, water shall be incorporated into the mixture. Excessive concentrations of water on or near the surface shall be avoided. After all mixing water has been applied, mixing shall continue until a uniform intimate mixture of sand, soil, and water has been obtained. The soil, sand, and water shall be mixed and pulverized with a rotary tiller or similar mixer approved by the Engineer.
- E. After mixing and pulverizing, compaction shall be started. Not more than 60 minutes shall elapse between the start of water mixing and the start of compaction of sand and soil. The mixture shall be loose before compaction begins for the full six-inch depth. The loose mixture shall be compacted to 95% Standard Proctor Density.
- F. After compaction, the subgrade shall be shaped to the required lines, grades, and cross-section. If necessary, during shaping operations, the surface of the subgrade

shall be lightly scarified to remove any tire prints or smooth surfaces left by equipment. The resulting surface shall then be compacted to 95% standard Proctor Density.

3.2 FORMS

- A. Forms shall be full depth of the concrete and of a strength, when staked, sufficient to resist the pressure of the concrete and the loads resulting from the finishing operations without springing, setting, or losing their shape. All forms shall be free of bulge and warp, and shall be cleaned thoroughly before being reused.
- B. Side forms shall be placed on underlying material that is at the proper grade. Set the side forms for full bearing on the foundation for the entire length and width and to the alignment of the edge of the finished pavement.
- C. Metal Forms. Use metal forms free from irregularities, dents, and sags. The top face of the form shall not vary from the plane of the face by more than one-eighth inch in 10 feet, and the lateral variation shall be not greater than one-fourth inch in 10 feet.
- D. Wood Forms: Use wood forms made of well-seasoned lumber of plank grade. Planks shall have a nominal thickness of not less than 2 inches and shall not vary on their edges more than 1/8-inch in 5 feet from the plane of the curve indicated on the drawings. The top face of the form shall not vary from the plane of the face by more than one-eighth inch in 10 feet.
- E. Setting and Removing Forms Not Specified Otherwise: The forms shall be joined neatly and tightly, staked securely to line and grade, and braced firmly throughout. Where practicable, set forms at least 500 feet in advance of the point where concrete is being placed. Oil forms thoroughly before concrete is placed against them. Forms shall remain in place for at least 12 hours after concrete has been placed against them; until the end of the curing period, the sides of the pavement shall be protected with moist earth or by other approved methods. Remove forms in a manner to preclude damaging the concrete.
- F. SLIP-FORM CONSTRUCTION (CONTRACTOR'S OPTION):
 - 1. Paving Equipment: Slip-form paving equipment shall be self-propelled, automatically controlled, full tracked, concrete paving, finishing machine, capable of spreading and shaping the plastic concrete mixtures as low as one-half-inch slump. The paver shall screed and finish the freshly-placed concrete in such a manner that a minimum of hand finishing is required.
 - 2. Slip-Form Construction: Uniformly distribute concrete without delay into final position by a slip-form paver. For the full paving width consolidate the concrete by internal vibration with transverse vibrating units or a series of longitudinal vibrating units. If a series of longitudinal vibrating units are used, they shall be spaced at intervals not to exceed 2½ feet, measured center to center.

3. Internal Vibration: The term "internal vibration" shall be by means of vibrating units located within the thickness of pavement section and a minimum distance ahead of the screed equal to the pavement thickness. The rate of vibration of each vibrating unit shall be not less than 8,000 vibrations per minute in the concrete and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot therefrom. The Contractor shall furnish a tachometer or suitable device for measuring and indicating the actual frequency of vibrations.
4. Equipment Support: When concrete is being placed adjacent to an existing pavement and part of the equipment is supported on the existing pavement, provide protection to prevent damage to the previously constructed pavement, such as, installing protective pads on crawler tracks or rubber-tire wheels and operating the equipment a sufficient distance from the pavement edge.
5. Alignment: No abrupt changes in longitudinal alignment of the pavement will be permitted. The horizontal deviation shall not exceed 0.10 foot from the established alignment of the pavement edge. Horizontal alignment shall be referenced to a taut stringline or the edge of a previously placed lane of concrete. Vertical alignment shall be referenced to a taut stringline or the surface of the underlying material.
6. Widths Less Than A Traffic Lane: Concrete required to be placed in widths less than a traffic lane may be compacted and shaped by a powered mechanical compacting and shaping machine, except that a transverse tube (pipe) compactor shall be subject to approval of the Engineer. Consolidation shall be supplemented with vibratory compactors. Where hand compaction is performed, construct a tamper of heavy plank with length that exceeds the width of the pavement by a minimum of one foot, shod with a heavy strip of metal for a tamping surface, and stiffened adequately to maintain the required shape during use. For concrete production in excess of 40 cubic yards per hour, and where all compaction is performed by hand methods, use at least two tampers.
7. Locations Inaccessible to Slip-Form Paving Equipment: Locations inaccessible to slip-form paving equipment shall be constructed as specified herein under "Conveying and Placing Concrete."

3.3 PLACING REINFORCEMENT:

- A. All reinforcing steel shall have a minimum cover of 1½ inch.
- B. For pavement thickness of 12 inches or more, install the reinforcement steel by depositing the concrete on the underlying material, consolidate, and strike-off the concrete to the indicated elevation of the steel reinforcement. Lay the reinforcement on the pre-struck surface and then place the remaining concrete and finish as specified.

For pavement thickness less than 12 inches thick, the reinforcement may be positioned on suitable chairs prior to concrete placement or the reinforcement steel may be depressed into the plastic concrete to the required elevation after the concrete has been spread.

- C. Do not extend reinforcement through expansion and contraction joints. Provide smooth doweled joints through expansion and contraction joints, as detailed on the plans or directed by the Engineer.

3.4 CONVEYING AND PLACING CONCRETE:

- A. **Conveying.** Convey concrete from the mixer to grade as rapidly as practicable. Use side discharge conveyors, bridge roller conveyors, or other similar conveyor systems which will not cause segregation or loss of ingredients. Deposit concrete as nearly as practicable in its final position to avoid rehandling. At any point in conveying, the free vertical drop of the concrete from conveyor to another shall not exceed 3 feet. For short distances, chuting is permitted from the transportation equipment only where the concrete is deposited into a hopper, mechanical spreader, or concrete bucket before it is placed on the underlying surface. When permitted to operate on the stabilized subgrade or base, concrete may be discharged in front of the paver. Clean conveying equipment before each run. Deposit concrete as soon as practicable after the forms have been oiled. Do not use concrete which has segregated in conveying or which is not protected from rainwater during a rain storm or rainy weather.

- B. **Placing:**

1. **General.** Concrete placement will not be permitted when weather conditions prevent proper placement and consolidation. Maintain drainage ditches, gutters and side drains to drain the base during the construction of the pavement. Placing shall be continuous between joint assemblies and/or side forms. Workmen shall not walk in freshly mixed concrete with boots or shoes that are coated with earth or foreign substances. Reinforcing steel, when used, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond.
2. **Concrete Placement.** Deposit concrete in its final location before initial set and in a manner that will require a minimum of rehandling. At the Contractor's option concrete may be placed between stationary forms or constructed to the desired cross section using slip-form pavers. All work incidental to the handling and placing of concrete shall be done in a manner that will not damage the underlying surface. Dampen the underlying surface before placing concrete. Place concrete continuously at a uniform rate without unscheduled stops except for equipment failure or other emergencies. Care shall be exercised to avoid contamination of plastic concrete with foreign material on construction equipment or workman's footwear. Concrete spread by hand shall be done with shovels and not with rakes. Immediately fill with fresh concrete any holes left on removing any excess material or removing

joint-forming devices. Thoroughly vibrate concrete adjacent to the forms and at joints.

3. Vibration. Immediately after spreading concrete, consolidate with internal vibrating equipment. For reinforced pavement vibrate only the concrete layer below the reinforcement. Vibrate concrete for full depth adjacent to edge forms and joints. Limit the duration of vibration to that necessary to produce consolidation of the concrete. Excessive vibration will not be permitted and generally vibrators shall not be operated in the concrete at one location for more than 15 seconds. Vibrators may be pneumatic, gas driven, or electric type and shall be operated at frequencies within the concrete of not less than 8,000 impulses per minute.
4. Placing Concrete in Cold Weather: Except when authorized specifically by the Engineer, concrete shall not be placed when the air temperature in the shade and away from artificial heat falls below 40 degrees F, or when the concrete without special protection is likely to be subject to freezing temperatures before the expiration of the specified curing period. Concrete shall not be placed on frozen or muddy subgrade. When the concrete is likely to be subjected to freezing temperatures within 24 hour after it has been deposited, or when so directed, heat the concrete materials so that the temperature of the concrete when deposited is between 50 and 90 degrees F. Use methods of heating materials which will not cause deleterious effects to the concrete. Water for mixing shall not be heated above 165 degrees F, however, if aggregates are not heated, the mixing water added to the aggregates may be heated to a maximum of 200 degrees F, prior to the addition of cement and as long as the temperature of the concrete conforms to the above. For a period of 72 hours after placing, maintain the temperature of the concrete at 50 degrees F or higher for a period of 72 hours, and at a temperature above freezing for the remainder of the curing period.
5. Placing Concrete in Hot Weather: Placing concrete in hot weather shall be in accordance with ACI 305 except as modified herein. Extra care shall be taken to reduce the temperature of the concrete being placed, and to prevent rapid drying of newly placed concrete. When the outdoor ambient temperature is more than 90 degrees F, the temperature of the concrete shall not exceed 90 degrees F; the fresh concrete shall be shaded as soon as possible after placing; and curing shall be started as soon as the surface of the fresh concrete is sufficiently hard to permit it without damage. Concrete placement temperatures shall be controlled by the Contractor at his expense and shall be accomplished by one or combination of procedures of ACI 305, but not limited to being accomplished by:
 - (a) shading and cooling the aggregates;
 - (b) avoiding use of hot cement;

- (c) cooling mixing water by additions of ice;
- (d) insulating water supply lines and tanks;
- (e) insulating mixer drums or cooling them with spays or wet burlap coverings;
- (f) working only at night; and
- (g) addition of a retarder or water reducing retarder in the mix, if approved by the Engineer.

Reduce the temperature of side forms by aerating the forms with wet burlap or similar covering materials. Cool underlying material by sprinkling lightly with water.

- 6. Protection Against Rain: All mixing and batching operations shall stop and the surface of the unhardened concrete shall be covered with protective covering. The length of pavement to be protected shall extend back to a point where the rain is not indenting the pavement surface. When slipform construction is used, install side forms in those areas of pavement where the edge cannot otherwise be protected to prevent edge erosion. After the rain ceases, install side forms as required to prevent excessive edge slump, and remove the protective covering without delay. Any water that remains on the pavement surface shall be removed. Areas of the surface where the texture has been damaged or exhibits a smooth sandy appearance shall be retextured and cured.

3.5 FINISHING CONCRETE:

- A. General Requirements: Start finishing operations immediately after placement of concrete. Use finishing machine, except that hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes that machine finishing is impracticable. The surface of the pavement on both sides of a joint shall be finished to the same grade. Finish formed joints from a transverse bridge securely supported. Provide hand finishing equipment for use at all times. Maintain finishing equipment and tools in a clean condition and free from hardened concrete or grout. When ambient conditions are such as to cause rapid loss of moisture from pavement surface, a uniform fog spray of water to restore the surface sheer may be applied during finishing operations. Avoid application of excessive amounts of water to the surface.
- B. Exposed surfaces of walks, and curb and gutters shall receive a broom finish.
- C. Exposed surfaces of roads and parking areas shall receive a burlap drag finish. Before the concrete becomes non-plastic, finish the slab surface by dragging on the surface a strip of clean, wet burlap measuring 3 to 10 feet long and 2 feet wider than the width of

the pavement. The finished surface shall have a fine granular or sandy texture without leaving disfiguring marks.

- D. Edging. At the time concrete has attained a degree of hardness suitable for edging, carefully finish all slab edges, including the edges at formed joints, with an edge having maximum radius of one-eighth inch. If brooming is specified for the final surface finish, edge all transverse joints before starting the brooming, then operate the broom to obliterate as much as possible the mark left by the edging tool without disturbing the rounded corner left by the edger. Clean by removing all loose fragments and soupy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill the voids solidly with a mixture of suitable proportions and consistency and refinish. Remove all unnecessary tool marks and edges. All remaining edges shall be smooth and true to line. Select tools, methods and workmanship to produce joints having edges of the same quality as other parts of the pavement as approved by the Engineer. After removal of forms, repair all damaged and honeycombed areas with mortar composed of one part portland cement to two parts sand.

3.6 CURING AND PROTECTION

Protect concrete from injurious action by the sun, rain, flowing water, frost, or mechanical injury and prevent concrete from drying out for a minimum of 24 hours.

3.7 PAVED PROTECTION:

- A. Road and parking area pavement shall be kept closed to all vehicular traffic for 7 consecutive days. At that time, the pavement may be opened to cars and pickup trucks. After 21 consecutive calendar days the pavement may be opened to all vehicles.
- B. Walks shall be closed to pedestrian traffic for 3 consecutive calendar days.
- C. Curb and gutter sections shall be closed to vehicular traffic for 21 consecutive calendar days.

3.8 PAVEMENT MARKINGS

- A. Surface preparation: New pavement surfaces shall be allowed to cure for a period of not less than 30 days before application of marking materials. All surfaces to be marked shall be thoroughly cleaned before application of the paint. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface latency, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications or trisodium phosphate solution or other approved detergent or degreaser, and rinsed

thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.

- B. Equipment: All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking small street parking areas. Applicator machines shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.
- C. Painting: Paint shall be applied to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. Paint shall be applied at a rate of coverage. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. All edges of markings shall be sharply outlined. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.
- D. Traffic Control: Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines to control traffic and prevent damage to newly painted surfaces. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

END OF SECTION

SECTION 310029

ASPHALT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

The Contractor shall furnish all labor, equipment, and materials to construct asphaltic concrete paving for roads and parking areas in accordance with these specifications and to the dimensions and typical cross-sections shown on the Plans.

1.2 WORK INCLUDED

The work shall include the following general requirements:

- A. Clear right-of-way, as required.
- B. Prepare subgrade including excavation and embankment.
- C. Install and/or construct drainage structures.
- D. Construct base course.
- E. Place asphaltic concrete on base course.
- F. Cleanup and restore right-of-way.
- G. Paint lines and markings where required.

1.3 TESTING AND INSPECTION

- A. Testing and inspection of embankment, subgrade, and testing of placed aggregate base course and asphalt pavement will be performed by an independent testing laboratory approved by the Engineer or Owner, and paid for by the Contractor. Send report to the Engineer within 24 hours after testing is complete. Testing and inspection will be performed so as to minimize disruption to the Work.
- B. Allow testing laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphalt concrete mix.
- C. When and if required, the testing laboratory will perform laboratory tests on proposed asphalt payment mix(es) to determine conformity with requirements.
- D. When aggregate as a course or portion thereof has been replaced and compacted in accordance with requirements, notify testing laboratory to perform density tests. Do

not place asphalt pavement until results have been verified and base course installation approved.

- E. If compaction tests indicate that aggregate base course or asphalt paving does not meet specified requirements, remove defective work, replace and retest at contractors own expense.
- F. The Engineer shall have access at all times to all parts of the batch plant for checking the adequacy of the equipment in use, inspecting the operation of the plant, verifying weight, proportions and character of materials and checking temperatures being maintained in the preparation of the mixtures.
- G. Testing schedule shall be as follows.

<u>Material</u>	<u>Test for</u>	<u>Frequency</u>
Embankment	Compaction	1 per lift per 2,000 S.F.
Subgrade	Compaction	

Roads:

For total length 500 ft. or less 1 per 2,000 S.F.

For total length greater than 500 ft. 1 per 5,000 S.F.

Parking areas:

Total paving area 3,000 feet or less 1 per 1,000 S. F.

Total paving area greater than 3,000 feet 1 per 1500 S.F.

Base Course Compaction Same as subgrade.

Asphalt Compaction Same as subgrade.

PART 2 - MATERIALS

2.1 SAND MODIFIED SUBGRADE

- A. Sand. The sand shall consist of fine, granular, silicious material with less than 10% passing the 200 sieve and 100% passing the No. 4 sieve. It shall have a P.I. less than 10.
- B. Water. The water for subgrade modification shall be clean and free from sewage, oil, acid, strong alkalies, or vegetable matter. The amount used shall vary with the moisture content of the soil.

2.2 BASE COURSE MATERIALS

- A. Aggregate Base Course shall meet the gradation requirements by weight passing square mesh sieve as follows:

<u>Sieve Size</u>	<u>Percent Passing</u>
1"	100
No. 4	30 to 60
No. 200	0 to 10
Liquid Limit	25 or less

Plasticity Index 0 to 6

Not less than 50% by weight of the particles retained on the No. 4 sieve shall have at least one fractured face.

- B. Primer: The bituminous material shall be of the MC-70 grade and shall meet the requirements of the following table.

	<u>Min.</u>	<u>Max.</u>
Water Percent	-	0.2
Flash Pt. (open tag) deg. F.	100	-
Kinematic Vis. at 140 deg. F.	70	140
Partial Distillates (percent of total distillate to 680 deg. F)		
To 437 deg. F	0	20
To 500 deg. F	20	60
To 600 deg. F	65	90
Residue from distillation		
To 680 deg. F. Vol.		
percent of sample by difference	55	-

2.3 ASPHALT PAVEMENT MATERIALS

A. Mineral Aggregate:

1. Mineral aggregate shall consist of crushed slag or crushed gravel composed of hard durable fragments. The portions of the material retained on a No. 4 sieve shall be known as coarse aggregate, and that portion passing a No. 4 sieve shall be known as fine aggregate.
2. When produced from gravel, not less than 50% by weight of the coarse aggregate particles shall be particles having at least one fractured face.
3. The mineral aggregate shall be well graded from coarse to fine and when tested by means of laboratory sieves with square openings shall conform to the following limits:

Percent By Weight Passing

Sieve Designation	Square Mesh Sieve
3/4"	100
3/8"	65-90
#4	50-70
#10	35-55
#40	15-30
#200	4-9
Liquid Limit	25 or less
P. I.	6 or less

4. Coarse aggregate shall be clean, free from disintegrated stone, vegetable matter or other deleterious substances and shall show a loss of not more than 40% when tested in accordance with AASHTO T-96.
- B. Bituminous Material: The bituminous material shall be graded AC-10 viscosity or 85-100 penetration asphalt cement. The bituminous material shall meet the requirements of the Asphalt Association for the grade of material used.
- C. The asphaltic concrete pavement mix shall conform to the following requirements:

Stability (Marshall - 75 blow briquette)	1500 minimum
Flow (Marshall)	10 to 16
Percent Voids in Compacted Mix	3 to 7
Percent Voids Filled with Asphalt	75 to 85
Percent Asphalt Cement Content by Weight of Total Mix	5 to 7
Sand Equivalent	40 minimum
Compaction	96 Percent of Standard Proctor Density
Laboratory	Molded Specimen
D. Tack Coat:	Emulsified Asphalt SS-1, or Cut-Back Asphalt RC-70 or RC-250.

PART 3 - EXECUTION

3.1 SAND MODIFIED SUBGRADE:

- A. Mixing of sand and soil shall not take place when the weather is foggy or rainy, or when the subgrade is frozen.
- B. Mixing shall not take place when temperature is below 35 degrees F, or when conditions indicate that the temperature may fall below 35 degrees F within 24 hours.
- C. After clearing and grubbing, place a 2-inch thick layer of sand on areas to be covered by concrete. The subgrade shall then be scarified to a minimum depth of 6-inches.
- D. Immediately after the sand and soil have been mixed, water shall be incorporated into the mixture. Excessive concentrations of water on or near the surface shall be avoided. After all mixing water has been applied, mixing shall continue until a uniform cold intimate mixture of sand, soil, and water has been obtained. The soil, sand, and water shall be mixed and pulverized with a rotary tiller or similar mixer approved by the Engineer.
- E. After mixing and pulverizing, compaction shall be started. Not more than 60 minutes shall elapse between the start of water mixing and the start of compaction of sand and soil. The mixture shall be loose before compaction begins for full six-inch depth. The loose mixture shall be compacted to 95 standard Proctor Density.
- F. After compaction, the subgrade shall be shaped to the required lines, grades, and cross-section. If necessary, during shaping operations, the surface of the subgrade shall be lightly scarified to remove any tire imprints or smooth surfaces left by

equipment. The resulting surface shall then be compacted to 95 Standard Proctor Density.

3.2 PLACEMENT OF AGGREGATE BASE COURSE

- A. Bring base course to required depth(s) and profiles indicated. Extend base course minimum 6 inches beyond asphalt pavement width. Place in layers not exceeding 4 inches in depth. Compact each layer to 95 percent standard density. Properly compact areas adjacent to curbs, catch basins, manholes and other areas not accessible to rollers with mechanical or hand tamping devices. Ensure granular sub-base course materials are not contaminated with deleterious materials.
- B. Add water during compaction to bring granular material to optimum moisture content.

3.3 WEED CONTROL

One day before the application or placement of bituminous materials on the base, the surface shall be sterilized with herbicide. The chemical shall be applied at the rate of 4 pounds per 100 square feet. The compound may be applied to the surface dry or as a solution. If the herbicide is applied dry, water shall be added to the surface at a rate of 4 gallons per 100 square feet. If applied as solution, the chemical shall be dissolved at the rate of one pound per gallon of water and sprayed on at the rate of 4 gallons of solution per 100 square feet.

3.4 PRIMING PREPARED STABILIZED BASE COURSE

- A. Prime coat shall consist of bituminous material applied to the base course. Prime coat shall be applied only when the base is dry, free from frost, and contains moisture not in excess of that which will permit uniform distribution and the desired penetration. It shall not be applied when atmospheric temperature is below 60 degrees F, ground temperature below 70 degrees F, or where general weather conditions, in the opinion of the Engineer, are not suitable. Prime coat will not be applied if rainy weather is anticipated within a 12 hour period after application. The Primer shall be applied by pressure distributor.
- B. The amount of bituminous material per square yard for prime coat shall be from 0.3 to 0.5 gallons. The exact quantity (which may be varied to suit field conditions) shall be determined by the Engineer. After the prime coat has been applied, it shall be left undisturbed for a period of not less than 3 days. Any excess bituminous material remaining on the surface shall be blotted with sand or other approved material before the surface is opened to any kind of traffic. Any area of the primed surface that has become fouled by traffic or otherwise shall be cleaned before the paving is placed thereon.

3.5 PLACEMENT OF ASPHALT PAVEMENT

- A. The asphaltic concrete wearing course shall be of the thickness indicated and shall be of dense graded material which may be applied in one lift. It shall be applied only when

the weather is not foggy or rainy. The minimum air temperature in the shade at which the pavement may be laid shall be 35 degrees F if rising, or 40 degrees F if falling. No pavement shall be placed when general weather conditions, in the opinion of the Engineer, are not suitable.

- B. The percentage of bituminous material by weight to be added to the aggregate shall be between 5% and 7% of the weight of the dry aggregate, as determined by a proposed design as prepared by a professional testing laboratory and submitted in writing by the Contractor and approved by the Engineer. The material shall be mixed in a central mixing plant and transported to point of use at a temperature of not less than 225 degrees F. All loads shall be covered with tarpaulin or other material during transportation.
- C. Spreading and Compacting: Paving, equipment used for spreading shall result in an application of uniform thickness without segregation and of the required smoothness. While still hot, the material shall be uniformly compressed by rolling until all roller marks are ironed out and the wearing surface has acquired a density of not less than 95% of the calculated density as determined by AASHO T-166 or other approved methods. Compaction by vehicular traffic shall not be permitted.
- D. The motion of the rollers shall at all times be slow enough to avoid displacement of the mixture, and any displacement shall be at once corrected by use of rakes and fresh mixture, when required. In all places not accessible to the rollers, the mixture shall be compacted by hand tampers. Hand tampers shall weigh not less than 25 lbs., and shall have a tamping face area of not more than 50 sq. in. The surface of the mixture after compression shall be smooth and true to the established lines and grades. Before final acceptance, the finished course shall be tested with ten-foot straight edges.
- E. The variation of the surface from the testing edges of the straight edge between any two contacts with the surface shall at no point exceed 3/16 in. Any areas not meeting this requirement shall be corrected. Edges of asphalt paving shall be finished as detailed on the Drawings.

3.6 JOINING PAVEMENT

The joints between old and new pavements or between successive day's work shall be carefully made in such a manner as to insure a continuous bond between old and new sections of the course. Edges of existing pavement shall be exposed and cleaned and edges cut to straight, vertical surfaces. All joints shall be painted with a uniform coat of tack coat before the fresh mixture is placed.

3.7 PROTECTION OF PAVEMENT

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until it has cooled and hardened and in no case less than 6 hours.

3.8 PAVEMENT MARKINGS

- A. Surface Preparation. New pavement surfaces shall be allowed to cure for a period of not less than 30 days before application of marking materials. All surfaces to be marked shall be thoroughly cleaned before application of the paint. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface latency, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.
- B. Equipment. All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking small street and parking areas. Applicator machines shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.
- C. Painting. Paint shall be applied to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. Paint shall be applied at a rate of coverage. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. All edges of markings shall be sharply outlined. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.
- D. Traffic Control. Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines to control traffic and prevent damage to newly painted surfaces. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

END OF SECTION

SECTION 310200

WATER PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

The work of this section consist of furnishing and installing PVC and Ductile Iron pipe and fittings at the locations shown on the plans and in accordance with these specifications.

1.2 QUALITY ASSURANCE

- A. PVC Pipe: Pipe shall be as manufactured by Manville, Clow or approved equal. The contractor shall furnish an affidavit from the manufacturer that pipe meets the requirements of these specifications. All pipe shall be marked showing the following:

Manufacturer's Name or Trademark

Nominal Pipe Size and Size Base

Material Code

SDR Number

Pressure Rating

ASTM Designation

NSF Certification

- B. Ductile Iron Pipe: Pipe shall be as manufactured by U.S. Steel, Clow or approved equal. All pipe shall be marked showing the following:

Manufacturer's Name or Trademark

Pipe Class

Pipe diameter (nominal)

Date of manufacture

- C. Fittings: Fittings for PVC and Ductile Iron Pipe shall be manufactured by Clow, U.S. Pipe.

1.3 PRODUCT HANDLING

- A. Handle pipe carefully to insure delivery at the project site in sound, undamaged condition. The Owner or engineer will reject damaged pipe on-site. The contractor shall replace damaged pipe at no additional expense to the Owner.

- B. Pipe shall not be stored directly on the ground. Adequately support piping to prevent warpage. Use and maintain protective covers where pipe may be damaged by direct sunlight.

PART 2 - MATERIALS

2.1 PVC PIPE

Polyvinyl Chloride (PVC) pipe shall conform to the provisions of ASTM D-2241 for pressure rated pipe or AWWA C-900. The size shall be as shown on the Plans. All joints shall be integrally formed, rubber gasket, push-on type. Minimum pressure ratings shall be as follows:

Nominal Size ASTM D-2241 or AWWA C-900

	AWWA C-900	ASTM D-2241	
Pipe Size	Pressure C-900	SDR-21	SDR-26
2"	150 psi	200 psi	160 psi
4"	150 psi	200 psi	160 psi
6"	150 psi	200 psi	160 psi
8"	150 psi	200 psi	160 psi
10"	150 psi	200 psi	160 psi
12"	150 psi	200 psi	160 psi

4" through 12" DIAMETER INTEGRALLY RESTRAINED C900 PVC PRESSURE PIPE

GENERAL: 4" through 12" PVC integrally restrained pressure pipe shall be manufactured in accordance with American Water Works Association (AWWA) Product Standard C900 for nominal sizes 4" through 12" and shall have cast iron outside diameters. Pipe shall be furnished in laying lengths of 20 ft. +/- 1 ", and shall be made of compounds conforming to cell classification 12454 as defined in ASTM D1784. Pipe shall meet the pressure rating and/or the dimension ratio as shown on the plans.

JOINTS: Integrally restrained PVC pressure pipe shall be manufactured with an integral bell and spigot "push on" joint meeting the requirements of ASTM D3139 and utilize the Bulldog Restraint System. C900 PVC pipe shall be furnished with locked in place Rieber reinforced elastomeric gasketed joints to assure that the gasket will remain in place during field assembly.

Gasket material shall meet the requirements of ASTM F477. Lubricant used for pipe and fittings shall be nontoxic and have no detrimental effect on the gasket or pipe.

APPROVALS: Integrally restrained PVC pressure pipe shall be tested in accordance with the physical, dimensional, and performance requirements of AWWA C900. It shall be listed by Underwriter's Laboratories and bear the NSF seal. Each piece will be hydrostatically proof tested per AWWA C900 before being shipped.

Integrally restrained PVC C900 pressure pipe shall be Diamond Lok-21 as manufactured by Diamond Plastics Corporation, or approved equal.

2.2 POLYETHYLENE PIPE

High Density Polyethylene Water transmission and distribution pipe shall meet the specifications and requirements of American Water Works Association Standard C906 in sizes 4" to 54" and be joined by means of zero leak-rate butt fusion and approved mechanical joints, . The polyethylene pipe and fittings shall be made from prime virgin resins exhibiting a cell classification of PE 345434C as defined in ASTM D3350 with an established hydrostatic-design-basis of 1600 psi for water at 73 degree F. The resin shall be listed by the PPI (Plastic Pipe Institute) in its pipe-grade registry "TR-4". Pipe O.D. sizes 4" and 6" shall be steel pipe sizes (IPS), and all pipes shall be suitable for use as a fluid pressure conduit. Peak flow velocity of 5 ft/sec shall be used in the hydraulic engineering design.

The net pressure capability shall be the working pressure rating (WPR) as follows:

DR 13.5=WPR @ 160 psi DR 11=WPR @ 200 psi DR 9=WPR @ 250 psi

The wall thickness shall follow the Dimension Ratio(DR) system prescribed in AWWA C906. Laying lengths ar 40 ft. standard. the pipe is to be joined by heat fusion, flanges or other mechanical joint systems proven for HDPE pipes. Both pipe and fittings must be NSF listed by the manufacture and bear the "NSF-pw" logo or mark.

Pipe and fittings must be marked as prescribed by AWWA C906 and NSF. This will include nominal size, OD base (ie: 12" ductile iron pipe sizing, DIPS), dimension ratio, pressure class, WPR, AWWA-C906, manufacture's name, manufacture's production code including day, month, year extruded.

Each manufacture shall have an approved in-house QA/QC program providing compliance to the testing specifications and requirements of AWWA Standard C906 for both pipe and fittings.

All pipe and fittings shall have a date stamp less than six (6) months old. All pipe is to be welded by a certified welder using the manufactures recommended procedures.

2.3 DUCTILE IRON PIPE

Ductile iron pipe shall conform to AWWA C151 (ANSI A21.51). Pipe shall be Class 50 for 6-inch and larger, and Class 52 for pipe less than 6-inch. Pipe joints shall be as follows:

Joints for buried service shall be mechanical or slip-on. Gasket shall be of the same manufacturer as the pipe.

Joints for building or vault service shall be flanged per AWWA C115 (ANSI A21.15), Class 250.

All pipe shall have a cement mortar lining per AWWA C104 (ANSI A21.4), minimum 1/16-inch thick.

2.4 FITTINGS

Fittings for PVC, PE and Ductile Iron pipe shall conform to the provisions of AWWA C110. All fittings shall have the same joints as adjacent pipe and adequate for 250 psi working pressure. All fittings shall have a cement mortar lining per AWWA C104 (ANSI A21.4), minimum 1/16-inch thick.

2.5 TRACER TAPE OR WIRE

Detectable tracer tape shall be installed above PVC pipe. The tape shall be 2-inches wide, 5.5 mil polyethylene film with a metallized foil core. It shall weigh at least 35 pounds per one hundred square feet.

Trace wire shall be standard for the industry.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE IN TRENCHES

A. General Requirements for All Pipe

- (1) Pipe and fittings shall be installed on the grades and lines shown on the plans. Thoroughly clean pipe interiors of foreign matter before installation. When work is not in progress, securely close open ends of pipe and fittings. All pipe and fittings shall be new and free of blemishes.
- (2) Thrust blocks: Install thrust blocks at all tees, elbows, bends, crosses, reducers, and dead ends as shown on the plans or as recommended by the pipe manufacturer.
- (3) Inspection: Inspect pipe for defects before lowering into trench. Defective, damaged, or unsound pipe will be rejected.
- (4) Pipe Cutting: Cutting for closure or other reasons shall be done neatly by methods which will not damage pipe, lining or coating. Sharp edges shall be smoothed to prevent damage to gaskets.
- (5) In rock the trench must be excavated at least 6" below the the bottom of the pipe for bedding material as shown in the trench detail and outlined in the standard detail notes.

3.2 INSTALLATION OF PIPE IN VAULTS OR BUILDINGS

A. General Requirements for All Pipe

- (1) Pipe and fittings shall be installed on the lines shown on the Plans. Thoroughly clean pipe interiors of foreign matter before installation. Inspect pipe for defects before installation. Defective, damaged or unsound pipe will be rejected.
- (2) Pipe shall be run parallel with or at right angles to the adjacent walls or floors, except when not possible due to conflicts with other facilities.
- (3) Pipe Cutting: Cutting for closure or other reasons shall be done neatly by methods which will not damage pipe, lining or coating.
- (4) Joints: All pipe shall have flanged joints unless otherwise shown on the plans or approved by the Engineer.
- (5) Provisions for maximum flexibility are not always shown and the Contractor may add flexible joints where required, and approved by the Engineer.
- (6) All pipe shall be carefully aligned and shall be installed in a neat manner. The bolts in the flange joints shall be drawn up uniformly and tightly around the flange without over straining the flanges. All joints shall be made watertight.
- (7) Pipe Embedded in Concrete: All pipe and fittings embedded in concrete shall be accurately located and shall be securely held in place to prevent displacement when concrete is placed. Such embedded items shall be thoroughly cleaned of rust, grease.
- (8) Cleanup: After the pipe has been installed, tested, and disinfected the contractor shall thoroughly clean all parts of the building or vault. All pipe shall be cleaned of grease, metal cuttings and other debris.

END OF SECTION

SECTION 310201

GATE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

The contractor shall furnish all labor, equipment and materials to install gate valves and appurtenances at locations shown on the plans or directed by the Engineer.

1.2 SUBMITTALS

Furnish three sets of shop drawings or catalog cuts and complete maintenance data.

1.3 QUALITY ASSURANCE

Valves and appurtenances shall be manufactured by Mueller, M & H, Clow, Pratt, Crane, Darling, Walworth, DeZurik, or approved equal.

PART 2 - MATERIALS

2.1 GENERAL

- A. All valves shall have the name of the manufacturer and the size of the valve cast on the body or bonnet or shown on a permanently attached plate in raised letters.
- B. Valves for vault or building service shall be complete with all necessary operating handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, and wrenches which are required for proper completion of the valve installation.
- C. Valves for buried service shall be complete with gravel or concrete support pad, and two-piece valve box set in a 16-inch x 16-inch x 6-inch thick concrete pad. Concrete shall be 3000 psi at 28 days.

2.2 VALVES

- A. Vault or Building Service: The valve shall be iron body, bronze mounted with flanged ends, double-disc gate, rising bronze stem and conforming to AWWA C509. Design working pressure shall be 150 psi. The valve shall open counterclockwise and be operated by handwheel, unless otherwise noted.
- B. Buried Service: The valve shall be iron body, non-rising stem, resilient seat gate, o-ring sealed stuffing box, with mechanical joint ends. The valve shall open counterclockwise and have a 2-inch square operating nut.

2.3 T-HANDLE OPERATING WRENCHES

Operating wrenches shall be 4-feet total length as manufactured by Mueller, Clow or approved equal.

2.4 VALVE BOXES

The box shall be of sufficient length to reach from the pipe to at least one-inch above the final ground surface elevation.

The box shall be two-piece sliding type, cast iron, with 5/8-inch shaft. Extension pieces, if required, shall be the manufacturer's standard type. The word WATER or "W" shall be cast into the top of the lid, as appropriate for the service. Units shall be Mueller, Clow, or approved equal.

2.5 VALVE OPERATORS

A. All valve operators shall open by turning counterclockwise.

B. Valve operators shall be self-locking type to prevent creeping.

2.6 EXTENSION STEMS FOR VALVE OPERATORS (Buried Service)

Where the depth of the valve is such that its centerline is more than 4 feet below grade, operating extension stems shall be provided to bring the operating nut to a point 6-inches below the surface of the ground and/or box cover. Extension stems shall be constructed of steel and shall be complete with 2-inch square operating nut.

2.7 EXTENSION BONNETS FOR VALVE OPERATORS

Bonnet and stem shall be constructed of steel and given manufacturer's standard paint system. Bonnets shall be as supplied by Pratt, Allis Chalmers, or approved equal.

2.8 FLOOR STANDS AND EXTENSION STEMS

Floor stands shall be non-rising stem, indicating type, complete with all necessary steel extension stems, couplings, handwheels, stem guide brackets, and special yoke attachments as required by the values and recommended and supplied by the stand manufacturer. Stem guides shall be spaced so that the stem L/R ration does not exceed 200. Provide all necessary anchor bolts in Type 316 stainless steel. Floor stands shall be cast iron. All equipment shall be as supplied by Clow Corporation, Mueller Co. or approved equal.

2.9 VALVE SUPPORT PAD

All buried valves shall be supported by a concrete or gravel pad. The pad shall be at least 6-inches thick measured from the bottom of the valve. The horizontal dimensions of the pad shall be 6-inches greater than the largest centerline. Concrete shall be at least 3000 psi at 28 days. Gravel shall be clean, durable, and well-graded from 1/4-inch to one-inch.

PART 3 - EXECUTION

3.1 BURIED VALVES

Install valves in the line at locations indicated on the plans, unless otherwise directed, and set plumb on concrete or gravel pad. All foreign matter shall be removed from the valve interior prior to installation.

3.2 VALVES IN VAULTS OR BUILDINGS

Install in the lines as indicated on the drawings, unless otherwise directed. The value shall be oriented to provide easy access to the handwheel. All foreign matter shall be removed from the interior prior to installation.

3.3 PRESSURE TEST

Gate valve test shall be a part of the test on the companion water line(s).

3.4 DISINFECTION

Gate valve disinfection shall be with the part of the disinfection of the companion water line(s).

END OF SECTION

SECTION 310205

FIRE HYDRANT

PART 1 - GENERAL

(5) DESCRIPTION

The work shall consist of installing fire hydrants at locations indicated on the Plans or as directed by the Engineer.

(6) CERTIFICATION

Furnish an affidavit from the manufacturer that the hydrant conforms to AWWA Standard C502.

(7) SUBMITTALS

Furnish catalog cuts, complete maintenance data and assembly drawings.

PART 2 - MATERIALS

(8) HYDRANTS

The fire hydrants shall be the product of Mueller, Clow or equal.

- A. Main Valve: 5 1/4-inch, unless otherwise noted.
- B. Inlet Size: 6-inch
- C. Depth of Bury: 3'-6" minimum
- D. Operating nut: 1 1/2-inch pentagon
- E. Open: Left
- F. Threads: National Standard
- G. Hydrant main valve shall open against pressure.
- H. Barrel shall be dry type
- I. Bottom connection shall be mechanical joint
- J. Hydrant shall be provided with a ground break-off flange
- K. Stem seals shall be the O-Ring type
- L. Color of the shop-applied, above ground paint shall be red.

M. Nozzle arrangement:

The hydrant shall have two hose nozzles 180-degrees apart and one pumper nozzle centered between the hose nozzles. Hose nozzle diameter shall be 2 1/2-inch and pumper nozzle diameter shall be 4 1/2-inch unless otherwise noted.

N. Drain ports: two (minimum)

O. Nozzle cap gaskets shall be plastic or neoprene.

P. Type: 3-way

(9) GUARD POST

When required, provide three, 6-inch diameter, schedule 40 steel post filled with 3000 psi concrete. Post shall extend 3 feet below and 3 feet above finished ground surface. Post shall be located 2'-6" from the hydrant (measured from top nut on hydrant to center of post), and 120 degrees apart. Post shall not be placed directly in front of nozzles. Post shall be painted with two coats of alkyd. The minimum dry-film thickness shall be 5 mils.

(10) INSTALLING HYDRANT ON EXISTING WATER MAIN

A tapping sleeve and tapping valve shall be installed on the existing water main. Valve size shall be the same as the lead pipe. The sleeve and valve shall meet the applicable provisions of "Valves for Water Systems".

(11) LEAD PIPE

The pipe between the hydrant and water main shall be at least six-inch diameter. For new construction, the lead pipe material and bedding shall be identical to requirements for the new water main. For hydrants installed in existing mains the lead pipe shall consist of class 50 ductile iron or PVC per ASTM D-2241 or AWWA C-900 suitable for 150 psi working pressure.

(12) DRAINAGE AGGREGATE

Aggregate shall be clean, durable gravel, well graded from 1/4-inch to 1-inch.

(13) GATE VALVE AND BOX

The gate valve shall be 6-inch and perform in accordance with the applicable provisions of "Gate Valves". Connecting ends shall be mechanical joint.

PART 3 - EXECUTION

(14) EXCAVATION AND BACKFILL

Perform in accordance with the applicable provisions of "Trench Excavation and Backfill".

(15) HYDRANTS

Where applicable, hydrants shall be installed with pumper nozzle facing the adjacent roadway or parking lot. Set hydrant at such elevation that the connecting pipe shall drain to the main with a grade of 0.5 percent. Firmly block the back of the hydrant opposite the connecting pipe with a concrete thrust block braced against the vertical face of the trench with at least 4 cubic-feet in mass (2500 psi, min.; 4-inch slump, max.) and 4 square-feet in area to prevent the hydrant from blowing off the line.

(16) BRINDLE RODS

If the character of the soil is such that the hydrant cannot be securely wedged, a connecting piece with integrally cast mechanical joint glands, ductile iron retainer glands, or bridle rods and rod collars shall be used. Bridle rods and rod collars shall be not less than 3/4-inch stock and shall be protected by a coat of acid-resisting paint.

(17) DRAINAGE AGGREGATE AND BACKFILL]

Place not less than 6 cubic-feet of drainage aggregate around the base of each hydrant to insure drainage. A layer of 30-pound asphalt-saturated felt paper or 60 mil vinyl sheet shall be placed over the gravel to keep backfill material from sifting into the gravel. Thoroughly compact the backfill around hydrants, to the grade line.

(18) OPERATIONS CHECK

Clean hydrant interiors of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrant inspected in opened and closed positions to see that all parts are in working condition.

(19) PRESSURE TEST

- A. Installation on New Mains - The fire hydrant shall be pressure tested with adjacent lines.
- B. Installation on existing mains - The fire hydrant shall be isolated from the existing main by closing the tapping valve and testing in accordance with the requirement described in "Disinfection of Potable Lines".

(20) DISINFECTION

- A. Installation on New Mains - The hydrant shall be disinfected with adjacent lines.
- B. Installation on Existing Mains - The hydrant shall be isolated from the existing main by closing the tapping valve and disinfecting with the requirement described in "Disinfection of Potable Lines".

(21) PAINTING

Fire hydrants shall be painted with two coats of Pittsburgh, Koppers, Tnemec or approved equal, in accordance with the requirements of the Engineer.

(22) GATE VALVE AND BOX

The gate valve shall be installed 2'-6" from the centerline of the fire hydrant, and with the provisions of "Gate Valves".

(23) PIPE SPOOL

The spool shall be installed between the hydrant and gate valve (in new mains) or tapping valves (in existing mains). Bedding shall be identical to requirements for the water main (in new mains) or the applicable requirements of the section "Water Pipe and Fittings" in existing mains.

(24) TAPPING SLEEVES AND VALVES

Tapping sleeves and valves shall be installed in strict accordance with the requirements of "Tapping Sleeve and Valve".

END OF SECTION

SECTION 310206

WATER SERVICE CONNECTION

PART 1 - GENERAL

1.1 DESCRIPTION

The Contractor shall furnish all labor, equipment, and materials to install service connections as well as transfer services from existing to new lines in strict accordance with the applicable drawings and these specifications. Materials for the service line, meter, meter box and accessories shall be the types specified herein, shown on the drawings, and as indicated in the proposal. All materials shall be new and unused.

1.2 SUBMITTAL

Furnish 3 sets of catalog cuts and/or operation and maintenance manuals for the meter, meter setter, meter box, service clamp, corporation stop, and service line.

1.3 QUALITY ASSURANCE

- A. All materials and equipments shall be the product of a manufacturer with at least five (5) years experience.
- B. All water meters shall be of the same manufacturer.
- C. All meter setters, service clamps, and corporation stops shall be of the same manufacturer.
- D. All meter boxes shall be of the same manufacturer.

PART 2 - MATERIALS

2.1 SERVICE LINE

Service line shall be suitable for 150 psi working pressure. Line material shall be SDR 9 poly pipe or equal. All service lines from the main line to the meter shall be a minimum of 1" in diameter.

2.2 METERS

The meter shall be the positive displacement type. Features shall include heat treated glass, sealed register, register retainer, magnetic drive, magnetic shield, threaded connections and internal strainer. It shall have straight reading in U.S. gallons and conform to AWWA C-700. Meters one inch and smaller shall have cast iron bottom plates. The meter body shall have the manufacturer's serial number appearing thereon and have raised markings to indicate direction of flow and meter size. The read protectors shall be provided and the case shall have

provisions for wire sealing the meter body. The meter shall be designed for 150 psi working pressure. Meters shall be as manufactured by Sensus, or approved equal.

2.3 SERVICE CLAMPS

Service clamps shall be installed on all non-metallic pipe. They shall be single strap, ductile iron, neoprene gasket, as manufactured by Mueller or an approved equal. The tap size shall match the corporation stop as detailed in Section 2.4, below.

2.4 CORPORATION STOPS

Corporation stops shall be as manufactured by Mueller, or an approved equal. The outlet shall have a compression type connection. The size shall be as follows:

<u>Meter Size</u>	<u>Corp. Stop Size</u>
3/4" to 1"	1"
1" to 1-1/2"	1"
1-1/2" thru 2"	1-1/2"

2.5 METER YOKES

Meter yokes shall be 5/8" x 3/4" with 12" rise and angle meter stop, as manufactured by Mueller or an approved equal. End connections shall be compression type from the main line side to accommodate the 1" service line and shall be a 1" pipe thread on the user side of the setter for connection by the customer.

2.6 METER BOXES

Meter boxes shall be manufactured of HDPE. Boxes shall be round.. Minimum outside dimensions shall be as follows:

<u>Type</u>	<u>W/O Pressure</u>	<u>With Pressure</u>
	<u>Reducing Valve</u>	<u>Reducing Valve</u>
Round - Top Diameter	14.5"	14.5"
Bottom Diameter	22"	22"
Height	18"	18"

A light duty locking cast iron lid shall be provided. The boxes shall be a Carson-Brooks or equal.

PART 3 - EXECUTION

- A. Installation of service clamp or corporation stop shall be in strict accordance with the manufacturer's recommended procedures. After pressure testing is completed and accepted by the Engineer, backfill the excavated area in 8 inch lifts and compact to 95% Standard Density.
- B. Installation of meter yoke and meter shall be in accordance with the details on the Plans and the manufacturer's recommended procedure.
- C. The meter box shall be installed as detailed on the Plans or as directed by the Engineer, after pressure testing is completed and accepted by the Engineer. The top of the box shall be flush with the final grade. The box shall be set plumb, and backfill shall be placed in eight inch lifts all around and compacted by hand tamping. The center of the box cover shall match the center of the meterhead.
- D. The top of service line shall be installed a minimum of 30 inches below the final ground surface. Maximum trench width shall be four times line diameter.

The line shall be embedded in sand that has a P.I. less than 15. The sand shall extend at least one inch above and below the outside of the pipe.

After pressure testing is completed and accepted by the Engineer, backfill the trench in 8 inch lifts and compact by hand tamping.

Lines shall be placed under paved areas by the wet bore or dry bore method. The service line shall be located 4 feet below paving surface or 2'-6" below ditch invert whichever is greater. Annulus shall be backfilled with river sand by water jetting. No pipe joints shall be located in the bore.

Service lines shall be installed as nearly as possible at 90 degrees to the main.

- E. For service meters installed in new water mains, the entire service installation shall be pressure tested and disinfected with the new main.

For service meters installed in existing mains, the entire service connection shall be isolated from the existing main during pressure testing and disinfection. Pressure testing procedures shall be performed in strict accordance with applicable portions of "Hydrostatic Testing of Pressure Lines". Disinfection shall be performed in strict accordance with applicable portions of "Disinfection of Potable Lines".

END OF SECTION

SECTION 310207

HYDROSTATIC TESTING OF POTABLE LINES

PART 1 - GENERAL

1.1 DESCRIPTION

The work of this section shall consist of testing water lines and related valves and fittings.

1.2 QUALITY ASSURANCE

- A. Flow meters shall record the actual volume plus or minus 2 percent.
- B. Test gauges shall be ANSI B40.1, Grade 2A. Dial range shall be twice the required test pressure.

1.3 JOB CONDITIONS

- A. Testing shall not be performed until each system has been flushed and cleaned.
- B. Potable water lines shall be pressure tested before disinfecting.

PART 2 - MATERIALS

Not Applicable

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide test equipment including test pumps, gauges, instruments, and other equipment required.
- B. Water shall be furnished by the owner.
- C. All testing shall be performed in the presence of the Engineer or Inspector.
- D. Test time will be accrued only while full test pressure is on system.
- E. For buried service, lines shall be tested after backfill and proper compaction of trenches.

3.2 PROCEDURE

- A. The test shall be in accordance with AWWA standard C600. Leakage shall not exceed ten gallons per inch diameter per mile of pipe per 24 hours at 150 psi testing pressure.

3.3 ACCEPTANCE

- A. No pipe installation shall be accepted until the leakage does not exceed the amount specified in 3.2 A above.
- B. Replace leaking fittings, valves, lengths, of pipe or other appurtenances.
- C. Do not use paints, asphalts, tars, or other types of pipe compounds to eliminate leaks.

END OF SECTION

SECTION 310208

DISINFECTION OF POTABLE LINES

PART 1 - GENERAL

1.1 DESCRIPTION

The work of this section consist of disinfecting all portions of the water system, including interior and buried piping, valves, stops, and any portion of the existing connecting system that might have become contaminated during construction activities.

1.2 SUBMITTALS

Submit plan for gathering, transporting, and disposing of chlorine solutions and surplus materials after use.

1.3 QUALITY ASSURANCE

All mains and appurtenances shall be chlorinated in accordance with AWWA C601.

PART 2 - MATERIALS

2.1 CHLORINE COMPOUNDS

Chlorine-bearing compounds such as calcium hypochlorite or sodium hypochlorite may be used. These compounds must be able to produce approximately 65 percent available chlorine.

2.2 CHLORINE SOLUTIONS

Mixtures of liquid chlorine and water or gaseous chlorine and water may be used. Mixtures shall be applied by means of a solution-feed chlorinating device.

PART 3 - EXECUTION

3.1 DOSAGE

Place enough disinfecting material in the system to insure a chlorine dosage of 10 parts per million after 24 hours.

3.2 FILLING SYSTEM

Fill entire system with the chlorine solution. Open all taps and valves and leave open until a strong odor of chlorine is noticeable, after which close the taps and valves.

3.3 TEST PERIOD

Allow chlorinated water to remain in the system a minimum of 24 hours, then thoroughly flush the system. During retention period, operate all valves, stops, and other appurtenances to assist this disinfection.

3.4 BACTERIOLOGICAL EXAMINATION

After the system has been thoroughly flushed, take samples from representative points in the system per Oklahoma Department of Environmental Quality instructions.

3.5 DISPOSAL OF SOLUTION

The solution shall not be dumped into any lake or stream or drainage flowing into a lake or stream or into the sewage system.

3.6 POINT OF APPLICATION

The chlorinating agent shall be applied at the beginning of a pipeline extension or any valved section of same and through a corporation stop inserted in the top of the new pipe.

END OF SECTION

SECTION 311200

SANITARY SEWER LINES AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

The Contractor shall furnish all labor, materials, and equipment to install gravity and pressure sewer mains, sewer service lines, manholes, cleanouts and other associated appurtenances as detailed on the Plans and the requirements specified herein.

1.2 QUALITY ASSURANCE

Pipe and fittings shall be as manufactured by Manville, Carlon, Armco, American, Clow, U.S. Pipe or approved equal. The Contractor shall furnish an affidavit from the manufacturer that pipe and fittings meet the requirements of these specifications.

1.3 PROJECT HANDLING

- A. Handle pipe carefully to insure delivery at the project site in sound, undamaged condition. The Owner or Engineer will reject damaged pipe on-site. The Contractor shall replace damaged pipe at no additional expense to the Owner.
- B. Pipe shall not be stored directly on the ground. Adequately support piping to prevent warpage. Use and maintain protective covers where pipe may be damaged by sunlight.

PART 2 - MATERIALS

2.1 PIPE FOR GRAVITY SEWER MAINS

All pipe shall be either ductile iron or polyvinyl chloride conforming to the respective specifications below.

- A. Ductile Iron Pipe: Ductile iron pipe shall conform to Federal Specification WW-P-421. Joint material or gaskets that are recommended by the manufacturer for use with sewage shall be acceptable. Pipe size shall be as shown on the Plans.
- B. Polyvinyl Chloride Pipe (PVC): Polyvinyl chloride pipe shall conform to ASTM D3034. The minimum wall thickness shall be DR 35. Size shall be as shown on the Plans. All joints shall be integrally formed, rubber gasket, push-on type.

2.2 PIPE FOR SERVICE CONNECTIONS

All pipe shall be polyvinyl chloride (PVC) pipe. Minimum size shall be 4 inch nominal inside diameter.

- A. Polyvinyl Chloride Pipe (PVC): Polyvinyl chloride pipe shall meet the following requirements:

Unpaved areas - ASTM D1785, Schedule 40;

Paved areas - ASTM D1785, Schedule 80 or AWWA C900, DR-14.

2.3 PIPE FOR PRESSURE LINES

All pipe shall be either ductile iron or polyvinyl chloride (PVC) conforming to the respective specifications below.

- A. Ductile Iron Pipe: All pipe shall be manufactured in accordance with ASTM A134. Pipe shall be Class 50. Joints shall be mechanical.
- B. Polyvinyl Chloride Pipe (PVC): All pipe shall conform to ASTM D1785, Schedule 80 or AWWA C900, DR-18.

2.4 COUPLINGS FOR DISSIMILAR PIPES

Transition type couplings shall be factory manufactured to assure tight fit and smooth flow transition at the joint. Couplings shall be neoprene with stainless steel straps or approved equal.

2.5 FITTINGS

All fittings for gravity and pressure pipe shall match the adjacent pipe for material, size, joint type, and class or grade.

2.6 MANHOLE CONSTRUCTION

- A. Manhole Bases: All manhole bases shall be constructed with concrete in accordance with details on the Plans. Concrete shall have a compressive strength of not less than 3,500 psi at 28 days.
- B. Manhole Walls: Manhole walls shall be constructed with concrete (poured-in-place or precast).
 - 1. Portland Cement Concrete: shall conform to ASTM C94. It shall have a minimum compressive strength of 3,500 psi at 28 days. Poured-in-place concrete shall be protected from freezing and moisture for 7 days.
 - 2. Precast Reinforced Concrete Sections: shall be constructed in accordance with ASTM C478. Minimum wall thickness will be 1/12 the inside diameter plus one inch. Top sections may be either concentric or eccentric cones. Watertight joints shall be constructed using rubber gasket.

3. Cement Mortar: when required, shall consist of 1 part cement, 2 parts sand, and 1/4 part hydrated lime. Water shall be clean and potable.
 4. Grout: where required, shall be non-shrink, non-metallic as manufactured by U.S. Grout, Protex or an approved equal.
 5. Steps: Provide aluminum alloy 6005-T5 steps in accordance with ASTM Standard B-221.
 6. Frame and Cover: shall have a 2 foot - 5 1/4 inch diameter and a minimum combined weight of not less than 350 pounds. Frame and cover shall be manufactured by Neenah Foundry or an approved equal. The word "sewer" shall be cast into the top of the cover.
- C. Poured in Place or Precast: The decision of whether to use precast or poured in place type manholes will be left up to the contractor. However, if precast manholes are used then it is the responsibility of the contractor to field verify elevations shown on the drawings and verify number of lines at each manhole. The Owner will not accept unusable precast manhole sections. Unusable Sections will neither be patched and reused nor will they be purchased by the Owner.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Pipe shall be protected during handling against impact shocks and free fall. The pipe interior shall be free of extraneous material before lowering into trench. Cutting for closure or other reasons shall be done neatly by methods that will not damage pipe. Sharp edges shall be smoothed to prevent gasket damage.
- B. Pipe and appurtenances shall be installed on the alignment and grade shown on the Plans or established in the field by the Engineer.
- C. Concrete encasement shall be constructed in strict accordance with details on the Plans.
- D. All materials shall be inspected for defects. Defective, damaged or unsound materials will be rejected.
- E. Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Masonry units shall be stored on pallets and on level ground.
- F. All sewers constructed of ductile iron or vitrified clay pipe extending from the manholes shall be encased with concrete for a distance of 3 feet from the outside wall of the manhole. This support is not required for PVC pipe.

3.2 PIPE LAYING

- A. Pipe laying shall proceed upgrade with bell ends upgrade. Each pipe shall be laid accurately to the line and grade shown on the Plans. Pipe shall be laid and centered so that the sewer has a uniform invert. The alignment of the installed pipe shall appear straight to the naked eye and shall be such that a full circle of light can be seen between manholes.
- B. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers and adhesives shall be used as recommended by the pipe manufacturer.
- C. Where the location of the sewer line is not clearly defined by dimensions, the sewer line shall be located at least 10 feet from any existing or proposed water main, storm sewer, oil or gas line, buried electrical lines and conduits, and 50 feet from any water well or petroleum storage tank.
- D. Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.
- E. Pipe Bedding and Initial Backfill
 - 1. Bedding material for all type of pipe shall be as shown in the standard details.
 - 2. Polyvinyl Chloride: The bedding shall have a minimum thickness of one-fourth the outside pipe diameter or six inches, whichever is greater. Mechanical tamping methods shall be used to compact the bedding. Rest each section upon the bedding material for the full length of the barrel with recesses excavated to accommodate joints.

If the soil at the bottom of the trench is mucky or too soft to properly support the pipe, the Contractor shall stabilize the subgrade as necessary to prevent damage to the pipe. Crusherrun material shall be used, uniformly graded, 100% passing a 2-inch screen and not more than 30% passing a ½" screen.
 - 3. Ductile Iron. The bedding shall have a minimum thickness of four inches. Mechanical tamping shall be used to compact the bedding. The pipe shall be supported by the bedding for its entire length with recesses to accommodate joints.
- F. Wye Branches: Wye branches shall be installed at the locations shown on the Plans or at locations designated by the Engineer. Wye branches shall be installed so that a plane through the centerline of the main sewer shall make an angle of 45 degrees with horizontal plane through said sewer main.

- G. Where a project outfalls into an existing sanitary sewer, construction of the physical connection to the existing line shall be delayed until all upstream construction, including testing of lines and manholes is complete.

3.3 MANHOLE CONSTRUCTION

A. Manhole Bases

1. Benches shall be brush or broom finish.
2. Invert Channels
 - a. Invert channels shall be formed directly in the concrete base. They shall be smooth and semi-circular in shape conforming to the inside diameter of the adjacent sewer sections.
 - b. Make changes in flow direction by a smooth curve or radius as large as permitted by manhole size.
 - c. Make changes in grade and size gradually and evenly.
 - d. When pipe is laid through the manhole, remove the top half after the surrounding concrete has hardened.
3. Floors outside invert channels shall be smooth with a slope toward the channel between 1 inch and 2 inches per foot.
4. The base shall have a diameter at least 8 inches greater than the outside diameter of the manhole wall.
5. Minimum thickness shall be 8 inches for depths 8 feet or less, and 12 inches for depths greater than 8 feet.
6. Bases shall rest on undisturbed soil. Over-excavated spaces will be filled with concrete as part of the base.

B. Frames and Covers

1. In paved areas, the top of frame and cover shall be flush with finished pavement surface.
2. In non-paved areas, the top of frame and cover shall be 3 inch above finished grade or ground surface to reduce inflow of stormwater runoff.
3. In stormwater swales, top of frame and cover shall extend at least 6" above flow line of swale.

C. Manhole Walls: Manhole walls shall be constructed in strict accordance with the details on the Plans and the respective specifications below.

1. Precast Concrete Sections

- a. The bottom section shall not rest directly on the base. Pour 4 inches of concrete on the base and set and plumb the bottom section.
- b. Adjustment rings under the ring and cover shall be used to adjust to grade. No more than 8 inches of concentric rings may be used to bring top of manhole to finish grade.

3. Poured-in-Place Concrete: Concrete shall be placed in strict accordance with requirements of Section "Concrete". Minimum wall thickness shall be 6 inches for depths 12 feet or less, and 8 inches at depths greater than 12 feet. Forms shall be steel, or fiberglass sheets. No wooden, or metal spacers or struts shall not remain embedded in walls. Bases shall be poured monolithically with wall sections.

D. Pipe connections shall be made to the manhole using non-shrink self sealing plastic water stops, standard O-ring gasketed joints, special manhole couplings, or in accordance with the manufacturer's recommendations. All connections shall be watertight.

3.4 CLEANOUTS (LAMPHOLES)

Cleanouts shall be located and constructed as shown on the Plans. When the concrete cleanout frame base is complete, a standard cleanout frame is to be set in place and closed with a cleanout cover.

3.5 WYE AND SERVICE LINE RECORD

The Contractor shall keep a wye record that shows the distance in feet from the manhole to each wye or connection placed in the sewer main. A service line record shall be kept by the Contractor showing the length of pipe installed and the location in relationship to the house or building and the wye connection point. No separate payment will be made for these records.

END OF SECTION

SECTION 314100

TESTING GRAVITY SEWER LINES AND MANHOLES

PART 1 - GENERAL

1.1 DESCRIPTION

The contractor shall furnish all labor and equipment necessary to test gravity sewer lines and sanitary sewer manholes.

1.2 QUALITY ASSURANCE

- A. Test gauges shall be ANSI B40.1, Grade 2A. Dial range shall be twice the required test pressure.
- B. Flow meters shall record the actual volume plus or minus 2 percent.

1.3 SUBMITTALS

- A. Accuracy certification by approved independent testing laboratory for flow meter and gauges. Certifications shall be dated no more than 90 days prior to actual system test.

1.4 JOB CONDITIONS

- A. Testing shall not be performed until each line or structure to be tested has been flushed and cleaned.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide test equipment including test pumps, gauges, instruments, and other equipment needed to perform the test.
- B. Water shall be furnished by the Owner.
- C. All testing shall be performed in the presence of the Engineer or Inspector. Notify owner at least 48 hours prior to testing.
- D. Test time will be accrued only while full test pressure is applied.
- E. Perform test after backfill and proper compaction of trenches, and around manholes.

- F. Where lines are installed under roadways and parking areas, perform tests after completion of final subgrade preparation and prior to application of surface courses.

3.2 PROCEDURE FOR NEW SEWER SYSTEMS

A. Manholes

1. Manholes shall be tested first.
2. Plug inlet and outlet pipes and fill manhole with water to the lid seat ring inside the frame.
3. Let water stand for 1 hour to allow maximum absorption by manhole materials.
4. At the end of 1 hour, add water to bring the level back to the reference point (refer to 3.2, A(2)).
5. Run a drop test for 15 minutes. After 15 minutes, add a measured volume of water to bring the level back to the reference point, and record said amount. Two gallons is the maximum allowed for each manhole regardless of diameter or depth.

B. Lines

1. After manholes have passed the leak test, perform leakage tests on the lines.
2. Plug all lines entering the upstream manhole.
3. Plug the line to be tested in the downstream manhole.
4. All service lines and/or laterals entering the main line that is being tested shall be tested also, making sure that all air is evacuated where test plugs are inserted.
5. Fill the line and the upstream manhole with water to the reference point described in 3.2, A(2).
6. Test the line for 2 hours.
7. During the 2 hour test, measured quantities of water shall be added to maintain the test level within 1-inch of the reference point.
8. Pipe leakage shall not exceed 10 gallons per inch of pipe diameter per mile of pipe per day for any section of the line.

END OF SECTION

If this specification differs with the Oklahoma Department of Transportation 2019 Standard Specification for Highway Construction then the Oklahoma Department of Transportation 2019 Standard Specification for Highway Construction shall govern.

All Grading and Paving work to be done to in accordance with Oklahoma Department of Transportation 2019 Standard Specification for Highway Construction.

https://www.odot.org/c_manuals/specbook/2019%20-FULL-SPEC-Web-Version.pdf

**SECTION 324116
TERMITE CONTROL**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil treatment with termiticide.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the EPA-Registered Label for termiticide products.
- B. Product certificates.
- C. Soil Treatment Application Report: 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. Warranties: Sample of special warranties.

1.3 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 and who employs workers trained and approved by manufacturer to install manufacturer's products.
- B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 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 concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.5 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: Three years from date of Substantial Completion.

1.6 MAINTENANCE SERVICE

- A. Continuing Service: Beginning at Substantial Completion, provide 12 months' Insert number continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, terms for agreement period, and terms for future renewal options.

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 quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
 - 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. BASF Corporation, Agricultural Products; Termidor.
 - b. Bayer Environmental Science; Premise 75.
 - c. FMC Corporation, Agricultural Products Group; Talstar or TalstarOne.
 - d. FMC Corporation, Agricultural Products Group; Prevail.
 - e. Syngenta; Demon TC.
 - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

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

3.2 APPLYING SOIL TREATMENT

- 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. Proceed with application only after unsatisfactory conditions have been corrected.
- C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.
- D. 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.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil, including soil along 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; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Masonry: Treat voids.
 - 4. Penetrations: At areas where slabs will be penetrated.
- E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- F. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

- G. Post warning signs in areas of application.
- H. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 324116