

MHM

20022

Murfreesboro Housing Authority | OAKLAND COURT

Phase II

Murfreesboro, TN

Murfreesboro Housing Authority
415 N. Maple Street
Murfreesboro, TN 37130

100% Construction Documents

Building Package

November 13, 2020

PROJECT MANUAL

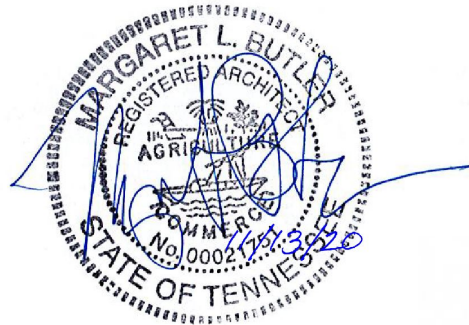


McCARTY HOLSAPLE McCARTY

ARCHITECT

McCARTY HOLSAPLE McCARTY ARCHITECTS, INC

550 WEST MAIN STREET SUITE 300
KNOXVILLE, TENNESSEE 37902
TEL: 865.544.2000 FAX: 865.544.0402



CIVIL ENGINEERING

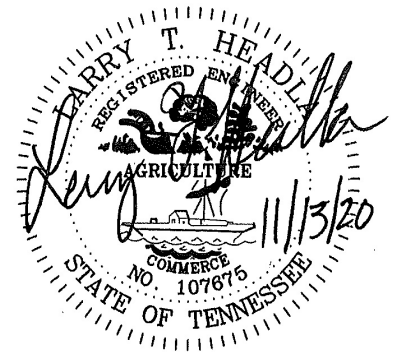
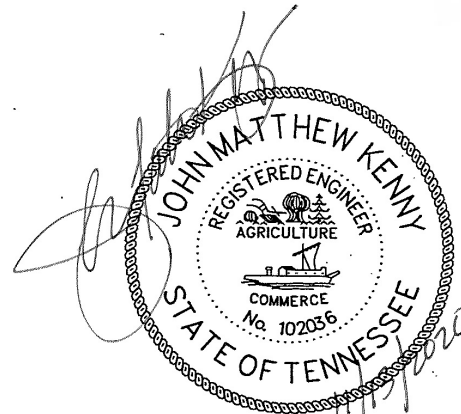
HUDDLESTON-STEELE ENGINEERING, INC.

2115 NW BROAD STREET
MURFREESBORO, TN 37129
TEL: 615.893.4084 FAX: 615.893.0080



**MECHANICAL/PLUMBING/ELECTRICAL
FACILITY SYSTEMS CONSULTANTS, LLC**

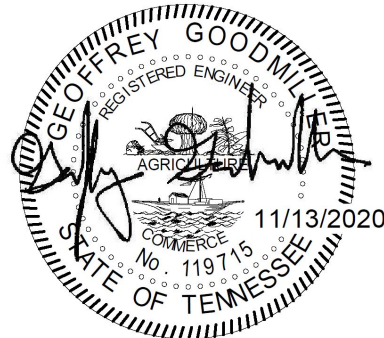
713 SOUTH CENTRAL STREET # 101
KNOXVILLE, TENNESSEE 37902
TEL: 865.246.0164 FAX: 865.246.1084



STRUCTURAL ENGINEERING

HAINES STRUCTURAL GROUP

800 S GAY STREET SUITE 1625
KNOXVILLE, TN 37929
TEL: 865.329.9920



LANDSCAPE ARCHITECT

RAGAN-SMITH ASSOCIATES

100 EAST VINE STREET, SUITE 402
MURFREESBORO, TN 37130
TEL: 615.546.6050 SPECS ON DRAWINGS

PROJECT IDENTIFICATION # 20022

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: Murfreesboro Housing Authority Oakland Court Housing, located at E. Lokey Avenue and N.Academy Street Murfreesboro, TN.
- B. The Owner, hereinafter referred to as Owner: Murfreesboro Housing Authority
- C. Owner's Representative: Partners Development.
 - i. Address: 520 W Summit Hill Dr Ste 603, Knoxville, TN 37902.
 - ii. Phone: (865) 524-7777.
 - iii. E-mail: afaison@partnersinfo.com.

1.02 PROJECT DESCRIPTION

- A. Summary Project Description: The project consists of demolition of current homes, sitework and infrastructure to prepare for the construction of new single family, duplex and triplex - 74 homes and community building at Oakland Court in Phase II. Included are: 74 new homes (units), Community Building, Pergola, new infrastructure, streets, street trees, lighting, parking courts, and park areas.
- B. Contract Scope: Demolition and new construction.

1.03 PROJECT CONSULTANTS

- A. The Architect, hereinafter referred to as Architect: McCarty Holsaple McCarty Architects, Inc..
 - 1. Address: 550 W. Main St., Ste. 300, Knoxville, TN 37902.
 - 2. Phone: 865-544-2000.
 - 3. E-mail: mbutler@mhminc.com.

1.04 PROCUREMENT TIMETABLE

Solicitation Posting Date: April 6, 2021

Pre-Bid Conference: April 13, 2021 at 10:00 am CST (virtual meeting).

Pre-Bid Site Tour: No site tour will be given as suppliers may visit site on their own. Last date for questions: April 20, 2021. Last date of Addendum April 22, 2021.

Bid Due Date: April 29, 2021 before 2 PM local time (CST)

Notice to Proceed: Upon approval from Owner.

Bids May Not Be Withdrawn Until: Not later than bid opening.

Contract Time: 15 months

Completion date is critical due to requirements of Owner's operations.

The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.05 PROCUREMENT DOCUMENTS

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
 - 1. Electronic copies are available on the MHA web page. www.mha-tn.org.
 - 2. Printed copies may be purchased at: Prographics, 1811 Church St., Nashville, TN 37023; 615-327-0386.

PART 2 PRODUCTS (NOT USED)

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General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 3/31/2020)

Applicability. This form is applicable to any construction/development contract greater than \$150,000.

This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 2 CFR 200, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 135. The form is required for construction contracts awarded by Public Housing Agencies (PHAs).

The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, HAs would be unable to enforce their contracts.

Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Responses to the collection of information are required to obtain a benefit or to retain a benefit.

The information requested does not lend itself to confidentiality.

HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

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1. Definitions

- (a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.
 - (b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.
 - (c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.
 - (d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.
 - (e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.
 - (f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Contract (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.
 - (g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.
 - (h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.
 - (j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.
 - (l) "Work" means materials, workmanship, and manufacture and fabrication of components.
- (a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.
 - (b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.
 - (c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.
 - (d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.
 - (e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.
 - (f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.
 - (g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.
 - (h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

- (a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

2. Contractor's Responsibility for Work

- (b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.
- (c) The Architect's duties and responsibilities may include but shall not be limited to:
- (1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;
 - (2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;
 - (3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,
 - (4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

- (a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.
- (b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress Schedule

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.

- (b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

- (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.
- (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.
- (c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.
- (d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

- (a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be

promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

- (b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", or "the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.
- (c) Where "as shown" "as indicated", "as detailed", or of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".
- (d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.
- (f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.
- (g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

- (h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.
- (i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

- (a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."
- (b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.
- (c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

- (a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.
- (b) Approval of equipment and materials.
 - (1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the

machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

- (2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.
- (3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
- (4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.
- (5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.
- (6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.
- (c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

- (a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

- (b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

- (a) In performing this contract, the Contractor shall:
- (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
 - (2) Protect the lives, health, and safety of other persons;
 - (3) Prevent damage to property, materials, supplies, and equipment; and,
 - (4) Avoid work interruptions.
- (b) For these purposes, the Contractor shall:
- (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
 - (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.
- (c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.
- (d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.
- (e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

- (a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.
- (b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

- (a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.
- (b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- (c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.
- (d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.
- (e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

- (f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
- (g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
- (h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
- (i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
- (j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
- (k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

- (a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- (b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contractor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of Construction

- (a) Definitions. As used in this clause -
 - (1) "Acceptance" means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
 - (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
 - (3) "Testing" means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
- (c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.
- (d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
- (e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

- (f) The PHA may conduct routine inspections of the construction site on a daily basis.
- (g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.
- (i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

- (a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas

occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of Construction

- (a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.
- (b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.
- (c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.
- (d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.
- (e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- (f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed in writing, for the benefit of the PHA; and,
 - (3) Enforce all warranties for the benefit of the PHA.
- (g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

- (h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.
- (i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.
- (j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within _____ calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

- (a) The PHA shall pay the Contractor the price as provided in this contract.
- (b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.
- (c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a

basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

- (d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.
- (e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:
 - (1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;
 - (2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,
 - (3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

Name:

Title:

Date:

- (f) Except as otherwise provided in State law, the PHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.
- (g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

- (h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.
- (i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.
- (j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.
- (k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in no wise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

- (a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.
- (b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or

responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

- (c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

- (a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the method or manner of performance of the work;
 - (3) PHA-furnished facilities, equipment, materials, services, or site; or,
 - (4) Directing the acceleration in the performance of the work.
- (b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.
- (c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.
- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.
- (f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

- (1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.
- (2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.
- (3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.
- (g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
- (h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
- (i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
- (j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

- (a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.
- (b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have

been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

- (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

- (a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
- (c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.
- (d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.
- (e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.
- (f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

- (a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

- (b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—
- (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
 - (2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

- (a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of \$ _____ [Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.
- (b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final

completion of the work together with any increased costs occasioned the PHA in completing the work.

- (c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for Convenience

- (a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
- (b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
- (c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
- (d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

- (a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:
- (1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.
 - (2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

- (3) Automobile Liability on owned and non-owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount] per occurrence.
- (b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.
- (c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

- (a) Definitions. As used in this contract -
- (1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

- (b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.
- (c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.
- (d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.
- (e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

- (a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
- (d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
- (e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

During the performance of this contract, the Contractor agrees as follows:

- (a) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.
- (b) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

- (c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
- (d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.
- (e) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- (f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- (g) The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (h) In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.
- (i) The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.
- (j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.
- 40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.**
- (a) The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
- (b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.
- (c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.
- (d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.
- (e) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.
- (f) Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
- (g) With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

- (a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

- (a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding \$10,000.
- (c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related Acts

If the total amount of this contract exceeds \$2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

- (a) Minimum Wages.
 - (1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.
- (3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the

amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

- (b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.
- (c) Payrolls and basic records.
- (1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)
- (ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
- (B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
- (C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
- (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.
- (3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to

make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

- (d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
- (e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.
- (f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.
- (g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.
- (i) Certification of eligibility.
 - (1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- (2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - (3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.
- (j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.
 - (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
 - (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.
 - (3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.
 - (k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

- (a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:
 - (1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;
- (b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or
- (c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

- (a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.
- (b) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of \$10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of \$10,000 of the item both under and outside that contract.

"General Decision Number: TN20210021 01/01/2021

Superseded General Decision Number: TN20200021

State: Tennessee

Construction Type: Residential

County: Rutherford County in Tennessee.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 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, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 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 calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

SUTN2009-020 09/10/2009

	Rates	Fringes
BRICKLAYER.....	\$ 12.72	0.00
CARPENTER.....	\$ 17.26	1.83
CEMENT MASON/CONCRETE FINISHER...	\$ 16.00	0.00
ELECTRICIAN.....	\$ 16.63	0.51
LABORER: Common or General.....	\$ 9.00	0.00
LABORER: Landscape.....	\$ 10.00	0.30

OPERATOR: Backhoe.....	\$ 13.17	0.00
PLUMBER.....	\$ 17.50	0.00
ROOFER, Including Shake and Shingle.....	\$ 10.25	0.00

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

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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 www.dol.gov/whd/govcontracts.

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 Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

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

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

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

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

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

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

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

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

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END OF GENERAL DECISION

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: MHA Oakland Court Phase II
- B. Owner's Name: Murfreesboro Housing Authority.
- C. Architect's Name: McCarty Holsaple McCarty Architects, Inc.
- D. Owner's Representative: Partners Development
- E. The Project consists of the demolition of 26 Buildings and single family and duplex units, sidewalks, driveways, trees and all existing improvements and the new construction of 44 Buildings - single family, duplex and triplex units, community building, pergola, parks, sidewalks, driveways, parking courts, landscaping and road improvements.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract.

1.03 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Utility Outages and Shutdown:
 - 1. Prevent accidental disruption of utility services to other facilities.

END OF SECTION

**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic and three hard-copies of each Application for Payment.

- J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 2. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

- A. Unit Prices shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

- A. The quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

- A. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.
- C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- D. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
- E. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.06 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products placed beyond the lines and levels of the required Work.

1.07 SCHEDULE OF UNIT PRICES

- A. item: Provide unit price by volume for the removal and replacement of unsuitable soils.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 23 00
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

- A. Alternate No. One - Tile back splash in kitchens.:
 - 1. Alternate Item: Section 09 30 00 - Tiling Deduct alternate to remove tile backspash in kitchen as illustrated in drawings and replace with backsplash panel behind stove Broan SP240108W.
- B. Alternate No. Two - Section 12 35 30 - Residential Casework Deduct alternate to go from painted finish to stained finish.:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 23 00 - Alternates, for product alternatives affecting this section.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project. Preapproved equals must be submitted with unit cost savings over as specified product.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.

- 2) Owner's, Architect's, and Contractor's names.
- b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
- c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
- d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- E. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Architect will consider requests for substitutions only within 90 days after date of Agreement.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 - 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

- D. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

**SECTION 01 26 20
WEATHER DELAYS**

PART 1 - GENERAL

1.01 EXTENSIONS OF CONTRACT TIME

- A. If the basis exists for an extension of time in accordance with paragraph 8.3 of the Conditions, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

1.02 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

- A. The Owner has reviewed weather data available from the National Oceanic and Atmospheric Administration and determined a Standard Baseline of average climatic range for the State of Tennessee.
- B. Standard Baseline shall be regarded as the normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

1.03 STANDARD BASELINE IS AS FOLLOWS:

- A. JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
- B. 12 11 8 7 7 6 7 5 4 5 6 11

1.04 ADVERSE WEATHER AND WEATHER DELAY DAYS

- A. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:
 - 1. precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure
 - 2. temperatures which do not rise above 32 degrees F by 10:00 a.m.
 - 3. temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified
 - 4. sustained wind in excess of twenty-five (25) m.p.h.
 - 5. standing snow in excess of one inch (1.00")
- B. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:
 - 1. for rain days above the standard baseline;
 - 2. only if there is a hindrance to site access or sitework, such as excavation, backfill, and footings;
 - 3. at a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by Architect.
- C. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day, including a weekend day or holiday if Contractor has scheduled construction activity that day.

1.05 DOCUMENTATION AND SUBMITTALS

- A. WEATHER DELAY REPORT:
 - 1. Use a Weather Delay Report, indicating for each calendar month the days on which construction activity affecting the critical path of the Work was prevented by weather conditions.
 - 2. In the column for the cause, indicate measurement of precipitation, temperature, wind, or other influencing factors.
 - 3. Describe the construction activity that was scheduled, on the critical path, and delayed.
 - 4. At the end of the month, add up the number of days delay, subtract the baseline number given in this Section, and show the resulting claimable days in excess of baseline.

5. Submit a copy of the completed report with the next application for payment. Reports submitted with applications for payment do not constitute a claim or preliminary claim for extension of time.
- B. When making a claim for a time extension based on weather delay(s):
1. Submit a copy of all reports completed since the last month for which a time extension was previously claim, or the commencement of Work if no previous claim, through the last month for which delay is being claimed. Claims for time extension based upon weather delays are unjustified if a submitted report does not corroborate the claim or if no report was submitted when it was required with an application for payment.
 2. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.
 3. Submit actual weather data to support claim for time extension obtained from nearest NOAA weatherstation or other independently verified source approved by Architect at beginning of project.
 4. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods, andsubmit in accordance with the procedures for Claims established in Article 15 of the Conditions, and the applicable General Requirements.
 5. If an extension of the Contract Time is appropriate, it shall be implemented in accordance with theprovisions of Article 7 of the Conditions, and the applicable General Requirements.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Construction progress schedule.
- G. Contractor's daily reports.
- H. Progress photographs.
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Requests for Interpretation (RFI) procedures.
- L. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Dates for applications for payment.
- B. Section 00 72 00 - General Conditions: Duties of the Construction Manager.
- C. Section 01 60 00 - Product Requirements: General product requirements.
- D. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- E. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AIA G716 - Request for Information; 2004.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Architect are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: Use one of the following:
 - 1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
 - 2. PlanGrid: www.plangrid.com.
 - 3. Procore: www.procore.com.
- D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
 - 4. Owner's Representative.
- 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, list of products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal schedule.
 - 6. Designation of personnel representing the parties to Contract, _____ and Architect.
 - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Scheduling.

- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
 - 6. Owner's Representative.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Application for payment procedures.
 - 9. Procedures for testing.
 - 10. Procedures for maintaining record documents.
 - 11. Requirements for start-up of equipment.
 - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
 - 6. Owner's Representative.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of RFIs log and status of responses.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Coordination of projected progress.

12. Maintenance of quality and work standards.
 13. Effect of proposed changes on progress schedule and coordination.
 14. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.06 DAILY CONSTRUCTION REPORTS

- A. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at monthly intervals.
 1. Submit in format acceptable to Owner.
- B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. Safety, environmental, or industrial relations incidents.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 7. Testing and/or inspections performed.
 8. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
- E. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Provide factual presentation.
 3. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.

3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 2. Prepare in a format and with content acceptable to Owner.
 - a. Use AIA G716 - Request for Information .
 3. Prepare using software provided by the Electronic Document Submittal Service.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 3. Transmit using approved form.
 - a. Use form generated by Electronic Document Submittal Service software. Identify each submittal item using the six-digit Specification Section number with spaces between the three pairs of numbers followed by a dash and a sequential two-digit number (e.g. 01 33 00-01). Resubmittals of each specific item shall include an additional sequential number after a decimal point (e.g. 01 33 00-01.1).
 - b. Separate different item types (e.g. Product Data, Shop Drawings, etc.) into separate submittals with a different sequential two-digit number behind the Specification Section number. For example the first submittal of this Specification Section would be for Product Data and be numbered 01 33 00-01, where the second submittal of this Specification Section would be for Shop Drawings and be numbered 01 33 00-02.
 - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, 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.

- a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
 - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
 - 8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 9. Provide space for Contractor and Architect review stamps.
 - 10. When revised for resubmission, identify all changes made since previous submission.
 - 11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 12. Incomplete and unorganized submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 - 13. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
- 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Submit concurrently with related shop drawing submittal but as a separate item.
 - 4. Do not submit (Material) Safety Data Sheets for materials or products.
 - 5. Submit sustainable design reporting submittals under separate cover.
- C. Shop Drawing Procedures:
- 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 - 2. Do not reproduce Contract Documents to create shop drawings.
 - 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
- 1. Transmit related items together as single package.
 - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 - 3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval.

3.15 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will not acknowledge receipt, and take no other action.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 - 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 - 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.

- b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
2. Not Authorizing fabrication, delivery, and installation:
- a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Tolerances.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

1.04 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

1.06 QUALITY ASSURANCE / CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- E. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- F. Window Installation and Building Envelope items are to be provided and installed in accordance with approved engineered shop drawings. Testing of systems is to be included for approval by the Architect.

1.07 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

1.08 INSPECTION AND TESTING LABORATORY SERVICES

- A. Contractor shall appoint and employ services of an independent firm to perform inspection and testing. Testing firm shall be acceptable to the Owner and the Architect. Contractor shall pay for all services. Refer to Section 01 20 00- Contract Considerations for minimum testing required.

1.09 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.

- b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
- c. To facilitate tests/inspections.
- d. To provide storage and curing of test samples.
- 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing, protection of the Work, and water control.
- E. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Project identification sign.
- J. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Contract Closeout: Final cleaning.
- B. Section 01 58 13 - Temporary Project Signage.

1.03 TEMPORARY ELECTRICITY

- A. Contractor will not be required to provide and pay for power services, existing service may be used.

1.04 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 TELEPHONE SERVICE

- A. Provide, maintain and pay for telephone service to field office at time of project mobilization.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operation.
- B. Provide protection for plant life designated to remain. Replace damaged plant life.
- C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.08 WATER CONTROL

- A. Protect site from puddling or running water. Provide water barriers as required to protect the site from soil erosion .

1.09 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

1.10 SECURITY

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

1.11 PARKING

- A. Contractor shall limit the use of parking to the rear project site. Coordinate with Owner.
- B. Approved construction parking will be approved by Owner before construction.
- C. Existing areas accessible by the public shall protect public and restricting access using solid barricades.
- D. Accessible routing shall be approved by Owner.
- E. Construction storage and construction work areas shall be fenced off to prevent public from entering.

1.12 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion and Final Application for Payment inspection.
- B. Remove underground installations to a minimum depth of 2 feet .
- C. Clean and repair damage caused by installation or use of temporary work.

1.14 FIELD OFFICES AND SHEDS

- A. Office Trailer: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, and drawing display table. Coordinate location with Architect.
- B. Sheds: Provide watertight and secure storage sheds as necessary to hold materials to be protected while stored on the site. Coordinate locations with Architect.

1.15 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.16 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.

1.17 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.
 - 3. Email: Account/address reserved for project use.

1.18 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

- B. Maintain daily in clean and sanitary condition.

1.19 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.20 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.21 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.22 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.23 WASTE REMOVAL

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.24 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location established by Architect.
- C. No other signs are allowed without Owner permission except those required by law.

1.25 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

1.26 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014 (Reapproved 2018).
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2013.

1.03 PERFORMANCE REQUIREMENTS

- A. Also comply with all more stringent requirements of State of TN Erosion and Sedimentation Control Manual.
- B. Runoff Calculation Standard for Urban Areas: USDA TR-55.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- L. Open Water: Prevent standing water that could become stagnant.
- M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 2. Obtain the approval of the Plan by authorities having jurisdiction.
 3. Obtain the approval of the Plan by Owner.

- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- E. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay.
 - 2. Wood waste, chips, or bark.
 - 3. Erosion control matting or netting.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Bales: Air dry, rectangular straw bales.
 - 1. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
 - 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet (1 m) long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot (1.98 kg per linear m).
 - 2. Wood, 2 by 2 inches (50 by 50 mm) in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- F. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:
- G. Gravel: See Section 32 11 23 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet (7 m), minimum.
 - 2. Length: 50 feet (16 m), minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart (at maximum of 60 m apart).
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet (30 m)..
 - b. Slope Between 2 and 5 Percent: 75 feet (23 m).
 - c. Slope Between 5 and 10 Percent: 50 feet (15 m).
 - d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
 - e. Slope Over 20 Percent: 15 feet (4.5 m).
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches (150 mm).
 - 2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
 - 3. Place and compact at least 6 inches (150 mm) of 1 1/2 to 3 1/2 inch (40 to 90 mm) diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.

2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
 7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 2. Install bales so that bindings are not in contact with the ground.
 3. Embed bales at least 4 inches (100 mm) in the ground.
 4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 5. Fill gaps between ends of bales with loose straw wedged tightly.
 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
 5. Incorporate fertilizer into soil before seeding.
 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

- D. Straw Bale Rows:
 - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 - 2. Remove silt deposits that exceed one-half of the height of the bales.
 - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Signage to advise public of areas of construction and temporary access

1.02 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr (80 km/hr) wind velocity.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, metal or wood, structurally adequate.
- B. Sign Surfaces: White PVC foam sheet 1/4" inch (____ mm) thick.
- C. Rough Hardware: Galvanized.
- D. Image for sign: Printed on sign base material, white. See drawings for design.

2.02 PROJECT IDENTIFICATION SIGN

- A. One printed project sign, 48 sq ft (4.5 sq m) area, bottom 6 feet (2 m) above ground.
- B. Multiple signs as required to adequately advise public of areas of construction and temporary access.
- C. Project Sign Content:
 - 1. Project number, Owner, title, logo and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of authorities.
 - 3. Names and titles of Architect.
 - 4. Name of Prime Contractor.
- D. Graphic Design, Colors, Style of Lettering: Designated by Architect.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.
- B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

- A. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc; 2016.
- B. NEMA MG 1 - Motors and Generators; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.05 QUALITY ASSURANCE

- A. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
 - 1. American Forest Foundation, The American Tree Farm System; refer to <http://www.treefarmssystem.org>.
 - 2. Canadian Sustainable Forest Management System, under CAN/CSA Z809; refer to <http://www.csasfmforests.ca>.
 - 3. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fscscanada.org>, for the USA visit <http://www.fscus.org>.
 - 4. Sustainable Forestry Board, under The Sustainable Forestry Initiative® of the American Forest & Paper Association; refer to <http://www.afandpa.org>.

5. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
 1. See Section 01 10 00 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 1. Made using or containing CFC's or HCFC's.
 2. Made of wood from newly cut old growth timber.
 3. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 4. Have longer documented life span under normal use.
 5. Result in less construction waste. See Section 01 74 19
 6. Are made of vegetable materials that are rapidly renewable.
 7. Are made of recycled materials.
 8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
 9. Are Cradle-to-Cradle Certified.
 10. Have a published Environmental Product Declaration (EPD).

2.03 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.
- B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Substitutions will be considered when a product, through no fault of the Contractor, becomes unavailable or unsuitable due to regulatory change.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- E. A request for substitution constitutes a representation that the submitter:
 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure (after contract award):
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. Burden of proof is on proposer.
 3. Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide off-site storage and protection when site does not permit on-site storage or protection.
 1. Execute a formal supplemental agreement between Owner and Contractor allowing off-site storage, for each occurrence.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Do not store products directly on the ground.
- L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- N. Prevent contact with material that may cause corrosion, discoloration, or staining.
- O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 61 16

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 07 90 05 - Joint Sealers

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

- D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.
- E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.
- F. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.
- G. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- H. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.
- I. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.
- J. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.
- K. SCS (CPD) - SCS Certified Products; Current Edition.
- L. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 - 4. Product data submittal showing VOC content is NOT acceptable evidence.
 - 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scs-certified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 - 2. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Aerosol Adhesives: GreenSeal GS-36.
 - 3. Joint Sealants: SCAQMD 1168 Rule.
 - 4. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - 5. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.
- J. Unit Turn Over
- K. Site logistics Plan

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- H. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- I. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. All execution and closeout requirements shall be in compliance with **HUD** Multifamily Accelerated Processing (MAP) Guide, 4430.G.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 2. Identify demolition firm and submit qualifications.
 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.
- F. Contractor is required to keep all areas accessible by the public clean and free of debris and or stored materials.
- G. Pre-Installation conference is required for any construction task or modification that involves the building envelope.
- H. Contractor is to keep elevator and elevator lobbies clean of debris and materials so as to not prevent any hazard for the public.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
1. Minimum of 10 years of documented experience.
- B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- E. Contractor's onsite supervision is required to have completed a minimum of a 30-hour osha training class with in 12 months of the project start date and have up to date State Erosion Control Certifications

1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.
 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements. Notification and approval by Owner of any utility service interruptions. Owner has to have this coordinated with tenants
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.

- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions. Notify Owner/Arch of any questionable surfaces, asbestos or unacceptable subsurface issues
- G. Any coordination of cable, internet requires a 45 day notice to Owner.
- H. Coordination of any Property Office services and office renovation schedule to be approved by Owner prior to initiation of construction.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of examination, preparation and installation procedures.
 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 2. Grid or axis for structures.
 3. Building foundation, column locations, ground floor elevations.
- I. Periodically verify layouts by same means.

- J. Maintain a complete and accurate log of control and survey work as it progresses.
- K. Construction Progress Schedule
 - 1. Contractor is required to keep a short-term progress schedule per floor and or building to monitor progress and assure timely turnover of units back to the Owner.
 - 2. Contractor is to include in project schedule the designated time for the Owner to move tenants out and back into the unit.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.
- F. Saws are to be located away from public and measures taken to eliminate dust and debris.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- I. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
 - 4. Cleanup of public areas is required daily to keep dust and debris out of areas used and accessed by public.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Provide all asbestos removal records showing location, removal and disposal per State requirements
- B. Close out documents are to provided in electronic format and are to be tabbed per section and item as noted in the Table of Contents. One hard copy is to be delivered to the site at Substantial Completion including a written warranty procedure.
- C. Protect installed work from damage by construction operations.
- D. Provide special protection where specified in individual specification sections.
- E. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- F. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- G. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- H. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- I. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- J. Prohibit traffic from landscaped areas.
- K. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 UNIT TURN OVER

- A. Contractor is to provide a schedule per building (as it applies) for approval and acceptance by the Owner.
- B. Contractor's planned duration per building cannot be altered except for unforeseen conditions and agreed on by Architect.
- C. When work has progressed for Owner/Architect inspection, the Contractor is to provide a list of punch list items that have been completed per unit along with the Owner's ready to rent form signed by the Project Superintendent. This is to verify that the unit has been inspected and the scope of work is complete and the unit has been cleaned.
- D. The Architect will provide the Contractor with the Architect/Owner's punch list and the Contractor will have 2 calendar days to complete any remaining punch list item.
- E. The Owner will schedule the Tenant move back to occur 2 calendar days after the initial inspection.
- F. Provided the Contractor does not meet the turnover of the units per the agreed-on schedule, the Contractor will be responsible for any additional cost occurred by the Owner has a result of the late delivery.
- G. Contractor is to note that per the HUD Map Guide units are not to be reoccupied until all work is complete.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.
- G. Include serial numbers for appliances and all HVAC equipment per unit in excel format documenting installed location/unit for each appliance or HVAC unit.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.
- B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operational at Substantial Completion..

3.13 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect and provide written Contractor's Correction Punch List when work is considered ready for Architect's Substantial Completion inspection.

- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.
- I. Field location notes:
 - 1. Contractor to provide asbestos records - where asbestos was located and removed illustrated graphically in locations on plans locating extents of removal.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
 - 4. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 4. Locate enclosures out of the way of construction traffic.
 - 5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 6. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect at Substantial Completion. One electronic and one hard copy required.
- B. Operation and Maintenance Data:
 - 1. Submit 1 hard copy and 1 electronic copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents at Substantial Completion. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit 1 hard copy and 1 electronic copy sets of revised final documents in final form within 10 days after final inspection.
 - 5. Submit 1 hard copy and 1 electronic copy Excel spreadsheet with serial number of all appliances and space where they are located.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. As- Built Drawings
 - 1. The GC/CM is responsible to keep a progressive set of record documents. These notes are to be transferred at the end of the project to a record set of contract documents that include all drawing updates and supplemental sketches issued by the Architect/Engineers.
 - 2. The Owner will provide a hard copy of the units numbered typical to the property. These unit layouts are to be used for the unit as-built record. Any modification to the plan or scope specific to the unit is to be noted on this drawing. For example, if bathroom abatement is not included in the typical scope but it was completed in a specific unit, that unit should note what was abated. Or if hot water heater replacement is not included but was done in unit 100, then unit 100 would be noted that the hot water heater was replaced.
 - 3. At Substantial Completion, the Architect is to issue an updated set of contract documents for the GC/CM that includes all drawing revisions from the Architect and Engineering discipline so the GC/CM can incorporate all of the field modifications and any other necessary information as noted below for a complete record set.
 - 4. It is to be noted that per the contract specifications, it is the GC/CM's responsibility to produce the as-constructed record. The GC/CM is responsible for it being thorough and accurate.
 - 5. The final set of As-Built Record drawings to be submitted 30 days after Substantial Completion are to include all items such as:
 - a. All abatement needs to be marked per unit.
 - b. All structural repairs need to be marked per unit.
 - c. All water line location and repairs and or new lines need to be marked per unit.
 - d. All new sewer repairs and or replacements need to be marked per unit.
 - e. All cutoff/shut offs not shown on the contract documents need to be located on the as-built.
 - f. A unit labeled photograph of all open wall cavities after the new work is complete is to be provided for each unit.
 - g. Any additional scope added but not shown in an architectural/engineer drawing revision should be marked.
 - h. List any product variance or installation change required that differs from the contract documents. These changes should be initialed by the Architect as acceptable.
 - i. As-Built Drawings are to note any field directive given by the Architect/Engineer and this change should be initialed and dated by the all parties.
 - j. As-Built Drawings should reference all RFI's.
 - k. As-Built Drawings should reference any change orders.
 - l. As-Built Drawings should note any field modification. These changes should be initialed by the Architect as acceptable.
 - m. All Architectural/Engineering supplemental drawings are to be added by the Architect/Engineer into a record set. This record set is to have all As-Built notifications added and is to become the final As-Built record set provided to the Owner at closet out.
- G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- K. Include test and balancing reports.
- L. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Operation and maintenance data.
 - c. Field quality control data.
 - d. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined. Any item that needs to be registered with the manufacturer for the warranty to be in affect is to be registered by the GC/CM and or Subcontractor that provided the item. If registration is not required, then this is to be stated by the GC/CM in the warranty documents Otherwise the GC/CM assumes responsibility.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- I. At project Substantial Completion General Contractor/Construction Manager is to provide:
 - 1. The GC/CM is to schedule a close out meeting with the Property Manager and Area Manger through the LHP Construction contact. In that meeting the GC/CM provide a copy of the warranty manual and as-built drawings to the Property Manager
 - 2. The GC/CM's contact during the 1-year warranty along with the written 1-year warranty letter.
 - 3. Letter should note that all items being turned over to the Owner at that time.
 - 4. O&M items, complete warranties and as-built drawings are to intended to be complete on the date of the Substantial Completion. However, if not the GC/CM is responsible to manage the warranty process until which time the GC/CM has provided the warranty information to the Property Manager and explained how their warranty process works.
 - 5. The subcontractor call list for the 1-year warranty services. The contact person is to be listed. The GC/CM is responsible to provide this from the Subcontractor/Supplier on the Subcontractor/Supplier letterhead.
 - 6. The extended warranty call list for all items that have an extended warranty. In the close out manual a cover sheet should be provided that includes the contact information of the manufacturer and the scope of the warranty as noted in the specifications. The executed warranty is also to be included. Note this is to begin at the date of Substantial Completion.
 - 7. A record of Training for items such as but not limited to:
 - a. Security System
 - b. Fire Alarm System
 - c. Access Control System
 - d. Elevator Controls
 - e. Location of any Shut-offs
 - f. Emergency Call Systems

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Landscape irrigation.
 - 6. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.

2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:

1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

**SECTION 02 29 20
LAWNS AND GRASSES**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Seeding.

- B. Related Sections include the following:

1. Section 31 10 00 - "Site Clearing" for topsoil stripping and stockpiling.
2. Section 31 00 00 - "Earthwork" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of the finished surface of planting soil,
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
1. Certification of each seed mixture for turfgrass sod, identifying source, including name and telephone number of supplier.
- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before the expiration of required maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
- B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- 1. Seed: Seed shall be grown and harvested within 500 miles of the project site. Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 15 to May 15
 - 2. Fall Planting: September 15 to October 15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until an acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish the lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
 - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch, Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water lawn at a minimum rate of 1 inch per week.
- D. Mow the lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1, Mow grass 2 to 3 inches high.

E. Lawn Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 pound/1000 square feet to lawn area.

PART 2 -PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: Seed of grass species as follows, with not less than 90 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed: 33% Five Point Fescue, 33% Shenandoah 2 Fescue, and 33% Fine Lane Fescue.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class 0, with a minimum 95 percent passing through No. 8 sieve and a minimum 55 percent passing through No. 60 sieve.

2. Provide lime in form of dolomitic limestone.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials.

G. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 dec./m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
- D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

- A. Selective Pre-emergent Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.8 PLANTING SOIL MIX

- A. Planting Soil Mix: Mix topsoil with the following soil amendments and fertilizers in the following quantities:
 - 1. Ratio of Loose Compost to Topsoil by Volume: 1:3.
 - 2. Ratio of Loose Peat to Topsoil by Volume: 1:3.
 - 3. Weight of Lime per 1000 Sq. Ft.: 25 pounds
 - 4. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.: 1 pound.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from

damage caused by planting operations.

- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil mix.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades, Limit fine grading to areas that can be planted in the immediate future.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING (repair work only)

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 5 to 8 pound/1000 square foot.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
- E. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after

completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch and roll to a smooth surface.

3.5 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with non-asphaltic, fiber-mulch manufacturer's recommended tackifier
 - 2. Apply slurry uniformly to areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.6 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5 by 5 inches.
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period.

END OF SECTION 02 29 20

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Demolition and removal of buildings and structures. This work includes the demolition and removal of the sidewalks and driveways associated with the buildings and structures as shown on the plans. Also included is the demolition and removal of all the private and public utility services regardless of location associated with each building and structure being demolished and removed. Coordinate the demolition and removal of the private utility services with the respective utility company. Trees and stumps to be removed as noted on plans.
2. Repair procedures for selective demolition operations.

- B. Related Sections include the following:

1. Section 01 51 00: Temporary Facilities and Controls, for temporary construction and environmental-protection measures for selective demolition operations.

1.3 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to the Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste shall become Contractor's property and shall be removed from the project site.

1.5 SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations of construction barriers.

- B. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
- C. Pre-demolition: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations.
- D. Landfill Records:
 - 1. Materials and debris shall be sent to a landfill approved by the State of Tennessee.
 - 2. Maintain and provide Owner's Representative with copies of waste manifest and landfill receipts.
 - 3. Provide manifests and disposal receipts for hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project site to review methods and procedures related to building demolition including, but not limited to, the following:
 - 1. Inspect and discuss the condition of construction to be demolished.
 - 2. Review structural load limitations of the existing structures.
 - 3. Review and finalize the building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued prior to start of the Work.
- B. Utility services to the buildings will be discontinued and service lines to the site will be cut and capped prior to start of the Work.

- C. Buildings immediately adjacent to the demolition area will be occupied. Conduct building demolition so the use of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours-notice of activities that will affect the operations of adjacent occupied buildings.
 - 2. Maintain access to existing parking, walkways, and other facilities used by occupants of adjacent buildings.
- D. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at the time of inspection for bidding purpose will be maintained by Owner as far as practical.
- E. Hazardous Materials: Hazardous materials are not present in buildings and structures to be demolished. A report on the removal of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials were present.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting the demolition operations.
- B. Review Project Record Documents of existing construction provided by the Owner. The Owner does not guarantee that existing conditions are the same as those indicated in the Project Record Documents.
- C. Survey existing conditions and correlate with the requirements indicated.
- D. Inventory and record the condition of items to be removed and salvaged. Provide photos or videos of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

- A. Existing Utilities: Locate and identify existing utilities serving buildings and structures to be demolished.
 - 1. Owner will arrange to shut off indicated utilities prior to Work. Coordinate with Owner as required.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent parking areas, drives, walkways, and other building facilities during demolition operations. Maintain exits from existing, occupied buildings.
- B. Temporary Protection: Erect temporary protection, such as walks and fences where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01500 - Temporary Facilities and Controls. Temporary fencing is to be installed as shown on the plans and is to remain in place through demolition and until new construction is complete.
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping that are to remain.
 - 3. Erect a plainly visible fence around the drip line of individual trees or around the perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and structures. If a temporary chain link fence has been erected around the property, relocate fence as necessary to provide protection.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work in accordance with applicable local, state and federal regulations.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: The use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Below-Grade Construction: Completely demolish and remove foundation walls, footings, and other below grade construction associated with buildings to be demolished.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements of Section 31 00 00 - Earthwork.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings, surfaces or other improvements caused by demolition operations. All repairs shall be as approved by the Owners representative.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from the Project site and legally dispose of them.
 - 1. Dispose of materials in accordance with state and federal regulations.
 - 2. Materials disposed of in a landfill, shall be done so in an EPA-approved and State of Tennessee approved landfill acceptable to authorities have jurisdiction.
 - 3. Do not allow demolished materials to accumulate on-site.
 - 4. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 02 41 00

SECTION 03 05 16
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Underslab Vapor Barrier:
 - 1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m² Pa)), maximum.
 - 2. Complying with ASTM E1745 Class A.
 - 3. Thickness: 15 mils (0.4 mm).
 - 4. Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil):
www.stegoindustries.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches (150 mm).
- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundation walls.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads and light pole bases.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- J. ACI 347R - Guide to Formwork for Concrete; 2014.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- M. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- Q. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- R. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- S. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

- T. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- V. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- W. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- X. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.
- Y. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- Z. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes; 2001 (Reapproved 2012).
- AA. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- AB. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- AC. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2016.
- AD. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement; 2012.
- AE. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
- AF. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).
- AG. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a, with Editorial Revision (2013).
- AH. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 2014.
- AI. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.
- AJ. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).
- AK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- AL. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.
- AM. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Blended, Expansive Hydraulic Cement: ASTM C845/C845M, Type K.
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
- D. Lightweight Aggregate: ASTM C330/C330M.
- E. Fly Ash: ASTM C618, Class F.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1. Installation: Comply with ASTM E1643.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
 - 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 - 3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).
 - 4. Products containing aluminum powder are not permitted.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
 - 1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
 - a. Maximum Height Change: Plus 4 percent.
 - b. Minimum Height Change: Plus 1 percent.
 - 2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch (82.7 MPa).

2.06 BONDING AND JOINTING PRODUCTS

- A. Waterstops: Rubber, complying with COE CRD-C 513.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
- B. Waterstops: PVC, complying with COE CRD-C 572.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
- C. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
 - 1. Size: As indicated on drawings.
- D. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
 - 1. Manufacturers:
 - a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
 - c. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
 - 1. Product dissipates within 4 to 6 weeks.
 - 2. Manufacturers:

- a. Dayton Superior Corporation; Clear Cure VOC J7WB:
www.daytonsuperior.com/#sle.
- b. Euclid Chemical Company; COLOR-CRETE CURE AND SEAL VOC:
www.euclidchemical.com/#sle.
- c. SpecChem, LLC; SpecRez: www.specchemllc.com/#sle.

C. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete: Per Construction Documents
 - 1. Water-Cement Ratio: Maximum 40 percent by weight.
 - 2. Maximum Aggregate Size: 5/8 inch (16 mm).

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.

- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring

and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
3. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

SECTION 03 54 13
GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes gypsum-cement-based, self-leveling underlayment over wood floors for application below interior floor coverings.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. For priming and sealing coatings, documentation including printed statement of VOC content.
 - 2. For priming and sealing coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Preinstallation Conference: Conduct conference at Project site.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.06 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

PART 2 - PRODUCTS

2.01 GYPSUM-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Allied Custom Gypsum; AccuCrete.
 - b. Ardex; GS-4 Self-Leveling Repair Underlayment
 - c. Bonsal American, an Oldcastle company; ProSpec Level Set G.
 - d. CMP Specialty Products, Inc.; Level Finish G-SL.
 - e. Conspec by Dayton Superior; Conflow Supreme.
 - f. Euclid Chemical Company (The); Flo-Top.
 - g. Maxxon Corporation; Gyp-Crete.
 - h. USG Corporation; Levelrock 2500.
 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
 3. Compressive Strength: Not less than 2000 psi at 28 days when tested according to ASTM C 109/C 109M.
 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Water: Potable and at a temperature of not more than 70 deg F.
- C. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
 2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
1. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
1. Install underlayment reinforcement recommended in writing by manufacturer.

- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.03 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply underlayment to produce uniform, level surface.
 - 1. Feather edges to match adjacent floor elevations.
- C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.04 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 13

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- G. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.
- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- I. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- J. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.
- K. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- L. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- O. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- R. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
- E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.04 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, lightweight.
 - a. Hollow block, as indicated.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type N.
- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type N.
 - 2. Color: Standard gray.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed billet bars; galvanized.
- B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- C. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M, Class B.
- D. Residential Wall Ties: Corrugated formed sheet metal, 7/8 inch (22 mm) wide by 0.05 inch (1.22 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to extend at least 1-1/2 inches (38 mm) into the veneer with at least 5/8 inch (16 mm) of mortar coverage from masonry face.
- E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
- F. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.04 FLASHINGS

- A. Metal Flashing Materials:
 - 1. Copper Flashing: ASTM B370, 060 soft annealed; 20 oz/sq ft (0.7 mm) thick; natural finish.
 - 2. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gage, 0.0187 inch (0.48 mm) thick; finish 2B to 2D.
 - 3. Prefabricated Metal Flashing: Smooth fabricated 12 oz/sq ft (3.66 kg/sq m) copper flashing for surface mounted conditions.

2.05 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type M.
 - 2. Exterior, loadbearing masonry: Type N.
 - 3. Exterior, non-loadbearing masonry: Type N.
 - 4. Interior, loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.02 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.04 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- E. Support flexible flashings across gaps and openings.

3.05 LINTELS

- A. Install loose steel lintels over openings.

3.06 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.07 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

END OF SECTION 04 20 00

SECTION 04 20 01
BRICK MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clay facing brick.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Installation of lintels.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 04.20.00 - Unit Masonry.
- B. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- D. Section 07 90 05 - Joint Sealers

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2018.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.
- F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.
- K. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- L. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
- M. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- N. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
- O. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.

- C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar and accessories and structural backup in mock-up.
- B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.09 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Color and texture to match Architect's sample.
 - 2. Queen Size: As indicated on drawings.
 - 3. Brick Units:
 - a. Brick Veneer 'A'. General Shale Brick, Stonefield Queen 6042023852
www.generalshale.com.
 - b. Brick Veneer 'B'. Driftwood Queen 6042060244 General Shale Brick,
www.generalshale.com.
 - c. Brick Veneer 'C'. General Shale Brick, Bridgemore Queen 6042025869
www.generalshale.com.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M Type N.
 - 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
 - 4. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Masonry Veneer Anchors at Wood Studs:
 - 1. Single-screw barrel veneer ties with factory-installed EPDM washers.
 - 2. Hot-dipped galvanized finish.
 - 3. Basis-of-Design Product: Thermal 2-Seal Wing Nut Anchor, manufactured by Hohmann & Barnard, Inc.
 - 4. Substitutions: See Section 01.60.00 - Product Requirements.

2.04 FLASHINGS

- A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
 - 1. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil (.05 mm) type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
 - a. Manufacturers:
 - 1) York Manufacturing, Inc; Multi-Flash SS: www.yorkmfg.com.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Weeps:
 - 1. Type: Polyester mesh.
 - 2. Color(s): As selected by Architect from manufacturer's full range.
- B. Drainage Fabric: Polyester mesh bonded to a water and vapor-permeable fabric.
 - 1. Manufacturers:
 - a. Advanced Building Products, Inc: www.advancedbuildingproducts.com.
 - b. Mortar Net Solutions: www.mortarnet.com.
 - c. York Manufacturing, Inc; Weep Armor Weep Vent Protection: www.yorkmfg.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Panels installed at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc: www.advancedbuildingproducts.com.
 - 2) CavClear/Archovations, Inc: www.cavclear.com.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Brick Units:
 - 1. Bond: as indicated on Drawings for various locations..
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar as work progresses.
- D. Interlock intersections and external corners, except for units laid in stack bond.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 16 inches (406 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.05 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches (400 mm) on center vertically and 24 inches (600 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.07 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
- B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

3.08 LINTELS

- A. Install loose steel lintels over openings.

3.09 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.
- C. Form expansion joint as detailed on drawings.

3.10 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm in 3 m) and 1/2 inch in 20 ft (13 mm in 6 m) or more.

- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm in 1 m) and 1/4 inch in 10 ft (6 mm in 3 m); 1/2 inch in 30 ft (13 mm in 9 m).
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.11 CUTTING AND FITTING

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

3.12 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 04 20 01 - Masonry Veneer: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- N. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- C. Plates: ASTM A36/A36M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bumper Posts and Guard Rails: As detailed; prime paint finish.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; hot dip galvanized and primed for paint finish.
- C. Lintels: As detailed; prime paint finish.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for paint finish.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION 05 50 00

SECTION 05 70 00
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 01 74 19 - Construction Waste Management and Disposal: Additional requirements for cleaning.
- B. Section 05 50 00 - Metal Fabrications: Supports.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).
- D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- B. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- C. Samples: Submit one (1) of each item below for each type and condition shown.
 - 1. Railing: 12 inch (305 mm) long section of handrail illustrating color, finish and connection detail.
- D. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- E. Manufacturer's Installation Instructions.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

1.06 MOCK-UP

- A. Provide mock-up of stair, railing system, freestanding center rail, and wall-mounted handrail, 4 feet (1.2 m) long by 4 feet (1.2 m) wide, illustrating each type of material, cladding, and finish.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory provided protective coverings and packaging.

- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.

1.08 WARRANTY

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 RAILING SYSTEMS

- A. Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
 - 1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Lateral Force: 75 lb (333 N) minimum, at any point, when tested in accordance with ASTM E935.
 - b. Distributed Load: 50 lb/ft (0.73 kN per m) minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
 - c. Concentrated Loads on Intermediate Rails: 50 psf (0.22 kgs per sq m), minimum.
 - d. Concentrated Load: 200 lbs (888 N) minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
 - e. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
 - 3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
 - 4. Field Connections: Provide sleeves to accommodate site assembly and installation.
 - 5. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - a. Ease exposed edges to small uniform radius.
 - b. Welded Joints:
 - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
- B. Metal Railing: Engineered, post-supported railing system with metal infill.
 - 1. Top Rail: 2" inch top rail as detailed on drawings.
 - 2. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
 - 3. Handrail and baluster supports: 2" as detailed on drawings.
 - 4. Wall Mounted Components: Components necessary to support railing with 1-1/2 inch (38 mm) clearance from wall, and as follows:
 - Underslung support brackets: Supports at 60 inches (1524 mm), maximum.
 - 5. Fasteners: Concealed.
 - 6. Infill at Picket Railings: Vertical pickets.
 - a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
 - b. Material: Solid steel bar.
 - c. Shape: Square.
 - d. Size: 1/2" inch square.
 - e. Top Mounting: Welded to underside of top rail.
 - f. Bottom Mounting: Welded to top surface of stringer or bottom rail.

2.02 ACCESSORIES

- A. Welding Fittings: Factory- or shop-welded from matching bar stock; joints and seams ground smooth.
- B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates for bolting anchors.
 - 4. Exposed Fasteners: No exposed bolts or screws.
- C. Carbon Steel Bolts and Nuts: ASTM A307.
- D. Sealant: Silicone; black.
- E. Finish Touch-Up Materials: As recommended by manufacturer for field application.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

- A. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
- B. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections and abraded areas.
 - 4. Touch up shop primer and factory applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- F. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 FIELD QUALITY CONTROL

- A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

3.06 CLEANING

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

3.07 PROTECTION

- A. Protect installed components and finishes from damage after installation.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Exposed timber structural framing.
- C. Non-structural dimension lumber framing.
- D. Rough opening framing for doors, windows, and roof openings.
- E. Preservative treated wood materials.
- F. Miscellaneous framing and sheathing.
- G. Concealed wood blocking, nailers, and supports.
- H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.
- C. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- D. Section 06 17 33 - Wood I-Joists.
- E. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- F. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- F. PS 1 - Structural Plywood; 2009.
- G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- H. PS 20 - American Softwood Lumber Standard; 2015.
- I. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 6" by 6" inch in size illustrating wood grain, color, and general appearance.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
 - 1. Grade: No 1/No 2.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):
 - 1. Species: Southern Pine.
 - 2. Grade: No. 2.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 EXPOSED DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings.
- C. Surfacing: S4S.
- D. Moisture Content: S-dry or MC19.
- E. Joist, Rafter, Small Beam, and Post Framing (2 by 6 through 4 by 16 (50 by 150 through 100 by 400 mm)):
 - 1. Species: Southern Pine.
 - 2. Grade: Select Structural.

2.04 EXPOSED TIMBERS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (20 percent maximum).
- C. Surfacing: S4S.
- D. Species: Southern Pine.
- E. Grade: Select Structural, Clear Heart.

2.05 STRUCTURAL COMPOSITE LUMBER

- A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.06 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653M.
- C. Water-Resistive Barrier: As specified in Section 07 25 00.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with masonry or concrete.
 - 2. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, and AWC (WFCM) Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Provide bridging at joists in excess of 8 feet (2.3 m) span as detailed. Fit solid blocking at ends of members.

- G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.07 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 10 00

**SECTION 06 16 00
SHEATHING**

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Underlayment.

1.02 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. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Sustainable Design Submittals:

1. For adhesives, documentation including printed statement of VOC content.
2. For composite wood products, documentation indicating that product contains no urea formaldehyde.
3. For adhesives and composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.03 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
 - 1. Plywood.
 - 2. Underlayment.
- C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- D. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- E. Factory mark panels to indicate compliance with applicable standard.

2.02 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.03 WALL SHEATHING

- A. Plywood Wall Sheathing: Exposure 1 Sheathing
 - 1. Span Rating: Not less than 32/16
 - 2. Nominal Thickness: Not less than 15/32 inch.

2.04 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 40/20.
 - 2. Nominal Thickness: Not less than 19/32 inch.

2.05 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1 Sheathing, , C-D single-floor panels.
 - 1. Span Rating: Not less than 24 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch.

3. Edge Detail: Tongue and groove.
4. Surface Finish: Fully sanded face.

2.06 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 or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.07 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.01 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. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Provide nailing pattern as dictated in structural documents.

2. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Provide nailing patterns according to shear wall schedules and typical structural details

3. Underlayment:
 - a. Nail to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION 06 16 00

SECTION 06 17 33
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood I-joists for roof and floor framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.
- C. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a, with Editorial revision (2016).
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2016.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
- C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
- D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
- B. Protect products from damage due to weather and breakage.
- C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
- D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood I-Joists:
 - 1. Boise Cascade Company; www.bc.com/#sle.
 - 2. Louisiana-Pacific Corporation; www.lpcorp.com/#sle.
 - 3. Weyerhaeuser Company; www.weyerhaeuser.com/#sle.

2.02 MATERIALS

- A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
 - 1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
 - 2. Oriented Strand Board: Comply with PS 2.
 - 3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
 - 4. Depth: As indicated on drawings.
 - 5. Fabrication Tolerances:
 - a. Flange Width: Plus/minus 1/32 inch (0.8 mm).
 - b. Flange Thickness: Minus 1/16 inch (1.6 mm).
 - c. Joist Depth: Plus 0, minus 1/8 inch (3.2 mm).
 - 6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
 - 7. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.
- B. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
- C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
- D. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, Spruce/Pine/Fir, construction grade, maximum moisture content of 19 percent.
- E. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.
- F. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install joists in accordance with manufacturer's instructions.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Install permanent bridging and bracing.
- E. Install headers and supports to frame openings required.
- F. Frame openings between joists with lumber in accordance with Section 06 10 00.
- G. Coordinate installation of sheathing/decking with work of this section.

END OF SECTION 06 17 33

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated wood trusses for roof and floor framing.
- B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.
- B. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- B. SPIB (GR) - Grading Rules; 2014.
- C. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.
- D. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2015.
- E. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1. Include identification of engineering software used for design.
 - 2. Provide shop drawings stamped or sealed by design engineer.
 - 3. Submit design calculations.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

- A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
 - 1. Species and Grade: Southern Pine, SPIB (GR) Grade No 2.
 - 2. Connectors: Steel plate.

3. Structural Design: Comply with applicable code for structural loading criteria.
4. Roof Deflection: 1/240, maximum.

2.02 MATERIALS

- A. Lumber:
 1. Moisture Content: Between 7 and 9 percent.
 2. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.
- B. Fasteners: Electrogalvanized steel, type to suit application.
- C. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Architect.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Coordinate placement of decking with work of this section.

END OF SECTION 06 17 53

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood stair rails, balustrades, treads and moldings.
- C. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.
- B. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.
- C. Section 09 93 00 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program; Current Edition.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2016.
- E. PS 1 - Structural Plywood; 2009.
- F. WI (CSIP) - Certified Seismic Installation Program (CSIP); Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- D. Samples: Submit two samples of stair balustrades and stair treads, 4 inch (____ mm) , illustrating finish and construction.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.

2. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.

1.07 MOCK-UP

- A. Provide stair rail and baluster full size, illustrating finish and construction.
- B. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.
- B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- C. Protect from moisture damage.
- D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Exterior Woodwork Items:
 1. Soffits and Fascias: Prepare for paint finish.
 2. Brackets, Finials, and Pediments: Prepare for paint finish.
- C. Interior Woodwork Items:
 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
 2. Handrails: 6010 Unfinished Oak- where transparent finish is required; Unfinished Poplar Stair Hand Rail where paint finish is required
 3. Newell Post: 4-5/8"x 55" Unfinished Wood Craftsman Box Newel-Oak/stain or Poplar/paint
 4. Balustrades: 41 in. x 1-1/4 in. Unfinished Poplar Square Baluster for paint finish
 5. Stair treads: Red Oak, unfinished ; prepare for transparent finish. 12 in. x 5-1/2 in. x 1-1/8 in. and for open end 48 in. x 11-1/2 in Miter-Return Stair Tread

2.02 SHEET MATERIALS

- A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- B. Medium Density Overlay Plywood - Interior or exterior grade as required where smooth painted surface is desired.
 1. FACE
 - a. Offshore veneer
 - b. Whole piece
 2. CORE:
 - a. Doug Fir or White Wood
 - b. Roseburg B underface and back, 2 Piece – 2 Side
 - c. C or better under back, 2 Piece – 1 Side
 3. CENTER:
 - a. Doug Fir or White Wood 'C' Grade or better, 1 Piece (composed OK)
 4. BACK:
 - a. Offshore veneer, whole piece – 2 Sides
 - b. Offshore veneer or Western Softwood – 1 Side
 5. TOLERANCES:
 - a. Touch Sanded
 - b. +/- .031 from nominal thickness for panels 3 / 4? and less
 6. PATCHING & SANDING:

- a. Not Sanded
- b. Overlay applied before pressing
- 7. 2 STEP:
 - a. Blank is sanded before applying overlay
- 8. STAMPING:
 - a. APA Stamp
- 9. BANDING AND STENCIL:
 - a. Top Cover / Waster sheet – 2 Sides
 - b. Stencil
 - c. 2 straps

2.03 SITE FINISHING MATERIALS

- A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.04 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 08 80 00 - Glazing: Glass for casework.
- C. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program; Current Edition.
- B. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at www.awmac.com/gis.php.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- D. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- F. UL (DIR) - Online Certifications Directory; Current Edition.
- G. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed countertop substrate and finish.

1.05 QUALITY ASSURANCE

- A. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 5. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.02 COUNTERTOPS

- A. Countertops are specified in Section 12 36 00.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Grommets: Standard painted metal grommets for cut-outs, in color as selected by Architect..

2.04 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Sliding Glass Door Track Assemblies: Upper and lower track of satin anodized aluminum, with matching shoe equipped with nylon rollers.
 - 1. Hafele Sliding Glass Door Fittings: EKU Clipo 36 GPK/GPKK Inslide. Provide locking mechanism.

2.05 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

2.06 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- F. Site glaze glass materials using the Interior Dry method specified in Section 08 80 00.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 61 00
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast plastic washroom vanities and washroom vanities with integral sink.

1.02 RELATED REQUIREMENTS

- A. Section 12 36 00 - Countertops: Solid surfacing countertops.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, design load parameters, methods of support, integration of plumbing components, and anchorages.
- C. Samples: Submit two samples representative of vanity top, 4"x4" inch in size, illustrating color, texture, and finish.
- D. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.
 - 1. Include instructions for stain removal, surface and gloss restoration.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site in original packages, containers or bundles bearing brand name and identification. Protect from damage by retaining shipping protection in place until installation.
- B. Store products under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight. Protect from moisture damage.
- C. Handle products to prevent damage to edges, ends, or surfaces.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cast Polymer Vanities:
 - 1. Products: Cloud White; center bowl, integral flush rectangular sink.
 - a. Wolf Home Products; www.wolfhomeproducts.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Provide finished products having flame spread index of 35 and smoke developed index of 15, when tested in accordance with ASTM E84 in thickness of 3/4 inch (19 mm).

- B. Resin: Polyester; integrally-colored, stain-resistant and resistant to domestic chemicals and cleaners.
- C. Filler Material: 2 Class A rated.
- D. Polishing Cream: Compatible polishing cream to achieve specified sheen to gel coat.
- E. Core Framing: Softwood lumber, clear and free of knots.

2.03 SITE FINISHING MATERIALS

- A. Finishing: Field finished as specified in Section 09 91 13..

2.04 FASTENINGS

- A. Adhesive: As recommended by the manufacturer for application; not containing formaldehyde or other volatile organic compounds.
- B. Concealed Joint Fasteners: Threaded steel.

2.05 FABRICATION

- A. Fabricate components by mold to achieve shape and configuration.
- B. Gel coat the finish exposed surfaces smooth and polish to a gloss sheen.
- C. Radius corners and edges.
- D. Cure components prior to shipment, except sheet materials requiring site handling.

2.06 FINISH

- A. Color: Architect to select from manufacturer's fullcolor range. .

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that joint preparation and affected dimensions are acceptable.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide anchoring devices for installation and embedding.

3.03 INSTALLATION

- A. Install components in accordance with approved shop drawings and manufacturer's instructions.
- B. Align work plumb and level.
- C. Rigidly anchor to substrate to prevent misalignment.

3.04 TOLERANCES

- A. Maximum Variation From True Dimension: 1/8 inch (3 mm).
- B. Maximum Offset From True Position: 1/8 inch (3 mm).

3.05 CLEANING

- A. Clean and polish surfaces in accordance with manufacturer's instructions.

3.06 PROTECTION

- A. Do not permit construction near unprotected surfaces.

END OF SECTION

SECTION 06 61 01
STRUCTURAL FIBERGLASS COLUMNS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, conditions of the contract and Division 1 Specifications sections, apply to work of this section.

1.02 SUMMARY

- A. Section Includes: Structural Fiberglass Columns. (Indicate if columns are to be factory split to be used as column covers)

1.03 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry: Framing of Opening and Blocking.
- B. Section 07 90 05 - Joint sealers

1.04 PRODUCT DESCRIPTION

- A. Columns shall be Structural Fiberglass Columns supplied/manufactured by Architectural Fiberglass, Inc. based on design (Tuscan, Doric, Attic, etc.)
- B. **Note:** Columns to be split in halves and tabbed where columns are to be used as column covers to wrap structural post.
- C. Column design shall have the correct proportions based on Orders of Architecture, except when cut to specific length
- D. Structural Fiberglass Columns are manufactured from E-Glass Fiberglass and Polyester Resin (Fiberglass Reinforced Polymers-FRP)
- E. Structural Fiberglass Columns meet ASTM E84-01 testing criteria for flame and smoke classifications.
- F. Caps, Bases and Plinths shall be made from fiberglass or polyurethane materials.

1.05 DESIGN REQUIREMENTS

- A. Installed architectural fiberglass column and fastening systems shall be designed, engineered, fabricated, and installed to conform to the state codes, local codes, and the Architect's design.

1.06 SUBMITTALS

- A. Literature & Shop Drawings: Shall illustrate dimensions, materials, thickness, fabrications details, attachments, and anchorage to substrates.
- B. Product Data: Submit manufacturer's product data and detailed installation instructions.
- C. Product Samples: Submit samples of manufacturing materials.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Handle, store and transport architectural fiberglass columns according to manufacturer's recommendations and in a manner that prevents damage.
- B. Protect architectural fiberglass columns from damage by retaining shipping protection in place until installation.
- C. Damage Responsibility: Except for damage caused by others, the installer is responsible for chipping, cracking, or other damage to fiberglass fabrications, after delivery to the jobsite and until installation is completed and inspected and approved by the Architect or owner's representative.

1.08 WARRANTY

Warrant architectural fiberglass columns to be free from defect due to materials and workmanship for **one** year.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER/SUPPLIER

Architectural Fiberglass, Inc.
 8300 Bessemer Ave., Cleveland, Ohio 44127
 1-888-483-1775, 216-641-8300, 216-641-8150 Fax

2.02 MATERIALS

Structural Fiberglass Columns are manufactured from E-Glass Fiberglass and Polyester Resin (Fiberglass Reinforced Polymers-FRP).

2.03 MATERIALS CHARACTERISTICS

A. Mechanical Properties:

PROPERTY	VALUE
Tensile strength	35,000- 50,000 PSI
Tensile modulus	2,500,000 – 3,600,000
Flexural strength	30,000 -50,000 PSI
Flexural modulus	2,500,000 – 3,600,000
Compressive strength	30,000 – 45,000 PSI
Water Absorption	0.5% (By wt.)
Barcol Hardness	50
Thermal expansion	.000012 l / deg F
Glass to Resin Ratio	60% / 40%

B. Average Wall Thickness & Load Bearing Capacity:

COLUMN BOTTOM DIA SHAFT SIZE	AVERAGE WALL THICKNESS	LOAD BEARING CAPACITY (Pounds)
12 “	5/32”	18,000
14”	5/32”	20,000
16”	5/32”	22,000
18”	5/32”	24,000
20”	11/64”	26,000
22”	3/16”	28,000
24”	13/64”	30,000
28”	7/32”	35,000
30”	7/32”	35,000
36”	7/32”	35,000

PART 3 – EXECUTION

3.01 PRE-INSTALLATION EXAMINATION

- A. Carefully observe and verify field conditions that substrates are ready for installation of architectural fiberglass fabrications. Contractor shall verify on site dimensions with shop drawings and assume full responsibility for fitting the components to the structure.
- B. Verify that bearing surfaces are true and level.
- C. Verify that support framing has been constructed to allow accurate placement, alignment and connection of architectural fiberglass columns to structure.
- D. Report discrepancies between design dimensions and field dimensions, which could adversely affect installation, to the Architect and / or Owner’s Representative.
- E. Do not proceed with installation until discrepancies are corrected, or until installation requirements are modified and approved by the Architect and / or Owner’s Representative.
- F. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install architectural fiberglass columns in accordance with manufacturer's instructions and approved shop drawings. If columns are split refer to shop drawings for repair and finishing of the joint.
- B. The position of the plinth must be determined by dropping a plumb line from the center of the soffit beam to floor. This point should be marked well on the floor.
- C. Measure the overall height. Raise the soffit or porch slightly and brace safely for later column placement.
- D. Measure length and if necessary, trim the shaft on the bottom only. Trim with an abrasive saw blade. Finish the top and bottom ends of the shaft with a rasp or sander to ensure an even load distribution around the shaft.
- E. Slide the capital (Tuscan/Roman Doric) over the neck and rest temporarily on the astragal until the shaft is in the proper position. Installation of decorative capitals other than Tuscan or Doric should be noted on shop drawings.
- F. Slide the base/plinth onto the shaft from the bottom.
- G. Stand column in a vertical position and slide into place where mark was made on the floor
- H. Use small L brackets to hold the shaft to the floor and do not let the bracket interfere with the position of the base/plinth. (Note: use through bolts on the shaft, do not use screws.)
- I. Remove brace and allow load to rest on the column evenly. Secure top of shaft with L brackets similar to the bottom of the shaft.
- J. Slide capital up to soffit and attach using corrosion resistant screws. Attach the base to the flooring using masonry or appropriate fasteners. Fill holes with polyester body filler such as bondo.
- K. Apply sealant between the capital and the shaft, and the base and the shaft for a completed appearance. (note: a gap around the base and shaft is normal and standard in the industry)

3.03 PAINTING AND FINISHING

- A. Make sure all surfaces are clean prior to painting. Lightly sand and remove all dust and dirt before applying primer or paint. Fill any visible surface scratches.
- B. Fiberglass column joints on split columns shall be finished with fiberglass repair kit and painted with high quality primer & paint
- C. Use a good quality exterior paint at least one coat of primer and two coats of paint. Oiled based primer is recommended.

3.04 CLEANING

- A. Clean installed architectural fiberglass fabrications using cleaning methods and material approved by manufacturer.

3.05 PROTECTION OF INSTALLED FABRICATIONS

- A. Comply with manufacturer's recommendations and instructions for protecting installed fabrications during construction activities.

END OF SECTION

SECTION 06 65 00
PLASTIC SIMULATED WOOD TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Free-Foam Cellular PVC Trim Boards for:
 - 1. Architectural exterior millwork – brackets and pediments/details
- B. RELATED SECTIONS
 - 1. Section 06 20 00 - Finish Carpentry.
 - 2. Section 09 29 00 - Gypsum Board.
 - 3. Section 09 91 13 – Exterior Painting.
- C. REFERENCES
 - 1. ASTM D 792 - Density and Specific Gravity of Plastics by Displacement.
 - 2. ASTM D 570 - Water Absorption of Plastics.
 - 3. ASTM D 638 - Tensile Properties of Plastics.
 - 4. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 5. ASTM D 1761 - Mechanical Fasteners in Wood.
 - 6. ASTM D 5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.
 - 7. ASTM D 256 - Determining the Pendulum Impact Resistance of Plastics.
 - 8. ASTM D 696 - Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and plus 30 degrees C with a Vitreous Silica Dilatometer.
 - 9. ASTM D 635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 10. ASTM E 84 - Surface Burning Characteristics of Building Materials.
 - 11. ASTM D 648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - 12. ASTM D 3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.
 - 13. ASTM D 2240 - Rubber Property - Durometer Hardness
 - 14. ASTM D 3345 - Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites.
- D. SUBMITTALS
 - 1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
 - 2. Product Data: Manufacturer's data sheets on each product to be used, including:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
 - 3. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.
 - 4. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. QUALITY ASSURANCE
 - 1. Manufacturer Qualifications: Manufacturer with a minimum of 5 years producing PVC trim products.
 - 2. Installer Qualifications: Installer with a minimum of 3 years experience with the installation of PVC trim products.
 - 3. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - a. Finish areas designated by Architect.
 - b. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - c. Refinish mock-up area as required to produce acceptable work.

- d. Accepted mock-ups shall be comparison standard for remaining Work
- F. DELIVERY, STORAGE, AND HANDLING
 - 1. Store products on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.
 - 2. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.
- G. SEQUENCING
 - 1. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
- H. PROJECT CONDITIONS
 - 1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- I. WARRANTY
 - 1. Provide manufacturer's transferable limited lifetime warranty against defects in manufacturing that causes the products to rot, corrode, delaminate, or excessively swell from moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Versatex, Web:www.versatex.com
 - 2. Ekena Millwork; www.ekenamillwork.com
 - 3. Permalife, Inc.; www.permalifeinc.com
 - 4. White River; www.whiteriver.com
 - 5. WholesaleMillwork; www.wholesalemillwork.com
 - 6. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
- B. MATERIALS
 - 1. PVC: Free Foam Cellular PVC material with a small-cell microstructure and density of .55 grams/cm³.
 - a. Performance and physical characteristic requirements:
 - 1) Physical:
 - (a) Density: 0.55 g/cm³ when tested in accordance with ASTM D 792.
 - (b) Water Absorption: Less than 0.50 percent when tested in accordance with ASTM D 570
 - 2) Mechanical:
 - (a) Tensile Strength: 3582 psi when tested in accordance with ASTM D 638.
 - (b) Tensile Modulus: 107,000 psi when tested in accordance with ASTM D 638.
 - (c) Flexural Strength: 5179 psi when tested in accordance with ASTM D 790.
 - (d) Flexural Modulus: 215,600 psi when tested in accordance with ASTM D 790.
 - (e) Modulus of Elasticity: 209,500 psi when tested in accordance with ASTM D 638.
 - (f) Elongation: 9.0 percent when tested in accordance with ASTM D 638.
 - (g) Nail Hold: 398 lbf/in of penetration when tested in accordance with ASTM D 1761.
 - (h) Compressive Strength: 6,553 psi (thickness dependent)
 - (i) Compressive modulus: 2,305 lbf/in (thickness dependent)
 - (j) Screw Hold: 240 lbf/in of penetration when tested in accordance with ASTM D 1761.

- (k) Staple Hold: 69 lbf/in of penetration when tested in accordance with ASTM D 1761.
- (l) Gardner Impact: 34 In-lbs when tested in accordance with ASTM D 5420.
- (m) Notched Izod Impact: 0.270 Ft-lbs/inch when tested in accordance with ASTM D 256.
- (n) Termite Resistance: Rating of 10 as tested in accordance with ASTM D 3345.
- (o) Hardness: 60+ when tested in accordance with ASTM D 2240.
- (p) Parking Garage Ceiling Soffit System: 225 psf when tested in accordance with UL 580.

3) Thermal:

- (a) Coefficient of Linear Expansion: 3.25×10^{-5} in/in/degrees F when tested in accordance with ASTM D 696.
- (b) Burning Rate: Failed to Ignite when tested in accordance with ASTM D 635.
- (c) Flame Spread Index: 20 when tested in accordance with ASTM E 84.
- (d) Heat Deflection Temp (264 psi): 146 degrees F when tested in accordance with ASTM D 648.
- (e) Heat Deflection Temp (66 psi): 153 degrees F when tested in accordance with ASTM D 648.
- (f) Oil Canning (@ 140 degrees F: Passed when tested in accordance with ASTM D 648.

b. Manufacturing Tolerances:

- 1) Variation in component length: Minus 0.00 / plus 1.00.
- 2) Variation in component width: plus or minus 1/32 inch.
- 3) Variation in component thickness: plus or minus 1/32 inch.
- 4) Variation in component edge cut: plus or minus 2 degrees.
- 5) Variation in Density plus or minus 0.02 grams per cubic centimeter.

c. Workmanship, Finish, and Appearance:

- 1) Free Foam Cellular PVC that is homogeneous and free of voids, holes, cracks, foreign inclusions and other defects. Edges must be square and top and bottom surfaces shall be flat with no convex or concave deviation.
- 2) Uniform surface free from cupping, warping, and twisting.

C. SIMULATED WOOD TRIM

- 1. Victorian Details Exterior Detail Scheme A
 - a. Pediment:
 - 1) WholesaleMillwork Gable Decoration Style GD-644 - smooth finish
 - b. Bracket:
 - 1) WholesaleMillwork Victorian Bracket Style # BKT19X9 - smooth finish
- 2. Victorian Details Exterior Detail Scheme B
 - a. Pediment:
 - 1) WholesaleMillwork Gable Decoration Style GD-630 - smooth finish
 - b. Bracket:
 - 1) WholesaleMillwork Victorian Bracket bkt22x21x1 - smooth finish
- 3. Second Empire Community Building bracket:
 - a. Ekena Millwork - 3" wide Std Diane Architectural grade PVC Corbel-size per dwgs.
- 4. Colonial Bracket Detail:
 - a. Bracket-Ekena Millwork 3" W x 36" D x 36" H Standard Olympic Architectural Grade PVC Brackets with traditional ends.

D. ACCESSORIES

- 1. Fasteners:
 - a. Use 12 gauge stainless steel fasteners designed for wood trim and siding. Fastener should have sufficient flexural and tensile strength to resist bending.
 - b. Use fasteners with thin shanks, blunt points, and full round heads that are long enough to penetrate the substrate a minimum of 1-1/4 inches.

- c. Do not use staples, small brads and wire nails. Avoid using fine threaded wood screws and ring-shank fasteners.
 - d. Use standard nail guns with a pressure setting between 70 psi and 100 psi. The recommended pressure depends on the type of gun, type of nail, ambient temperature, and the substrate. Care should be taken not to overdrive the nail into the material.
 - e. Pre-drilling is not typically required unless large fasteners are used or the product is installed during temperatures below 40 degrees F.
 - f. Use two fasteners for every framing member for trimboard applications. Sheet and trimboards 8 inches and wider require additional fasteners.
 - g. Install fasteners no more than 2 inches from the end of each board.
 - h. Avoid fastening simulated wood trim over hollow or uneven areas. Fasten onto flat, solid substrates.
 - i. 3/8 inch and 1/2 inch thick Sheet and Beadboard is not designed to be ripped and used for trim applications. These products must be glued and mechanically fastened to the substrate.
- 2. Adhesives: Finishing System.
 - a. All bonded surfaces must be smooth, clean, and in complete contact with each other for best results.
 - b. Adhere simulated wood trim to itself with PVC cement or cellular PVC adhesives to prevent joint separation. Acceptable adhesives are PVC Trim Welder, IPS Weld-On 705 (white), and Zevo PVC Trim adhesive.
 - c. PVC cements cure quickly (3-5 minutes or less), and have a limited working time.
 - d. Scarf cut joints are recommended where applicable.
 - e. Bonded joints should be secured with fasteners and fastened with two rows on each side of the joint.
 - f. When bonding simulated wood trim to other substrates, consult the adhesive manufacturer to determine suitability.
 - 3. Nail Hole Filler: Cortex plug system by Fasten Master.
 - 4. Sealants:
 - a. Use urethane, polyurethane, polymer blends or acrylic based sealants that do not contain silicone as specified in Section 07 90 05 - Joint Sealers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. PREPARATION
 - 1. Clean surfaces thoroughly prior to installation.
 - 2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- D. INSTALLATION
 - 1. Install in accordance with manufacturer's instructions.
 - 2. Cutting:
 - a. Simulated wood trim can be cut using standard woodworking saws. Conventional carbide-tipped blades designed for cutting wood are preferred. Avoid using fine-tooth metal-cutting blades.
 - b. Rough-cut edges are typically caused by excessive friction, poor board support, or worn or improper tooling.
 - 3. Drilling:
 - a. Simulated wood trim can be drilled using standard woodworking drill bits. Do not use drill bits made for rigid PVC.

- b. Avoid frictional heat build-up.
 - c. Remove shavings periodically from a drill hole as necessary.
 - 4. Milling and Moulding:
 - a. Simulated wood trim can be milled or moulded using standard milling or moulding machines found in millwork shops.
 - b. Rake angle 20 to 30 degrees. 25 degrees is recommended.
 - c. Cutting speed to be optimized with the number of knives and feed rate.
 - 5. Routing:
 - a. Simulated wood trim can be routed with virtually any piece of equipment used to rout wood.
 - b. Carbide tipped router bits are recommended.
 - c. Machinery that allows for multiple cutting speeds will allow you to optimize the process obtaining a smoother finished part.
 - 6. Edge Finishing:
 - a. Traditional sanding, grinding or filing tools used for woodworking are preferred.
 - 7. Nail Location:
 - a. For trimboard applications use two fasteners per framing member.
 - b. Use additional fasteners (3/4 inch preferred) for trimboard 8 inches and wider.
 - c. Install fasteners a maximum of 2 inches from the end of each board.
 - 8. Expansion and Contraction:
 - a. Simulated wood trim expands and contracts with changes in temperature. Properly fastening along the entire length is required to minimize expansion and contraction.
 - b. Allow 3/16 inch space per 18-foot run of trim for expansion and contraction.
 - c. Bond joints between pieces of simulated wood trim to eliminate separation.
 - d. Allow expansion and contraction space at the ends of long runs.
 - 9. Cleaning:
 - a. Clean simulated wood trim with mild detergent and water.
 - b. Products with pumice, such as Soft Scrub, may be applied with a nylon brush.
 - c. For more stubborn stains use a mild household cleaner and degreaser like Clorox Cleanup, Clorox Outdoors, Denatured Alcohol, Bleach, Mr. Clean Magic Eraser or Corte Clean with nylon brush.
 - 10. Painting:
 - a. Be sure surface to be painted is clean, dry, and free of dirt, loose or peeling paint, mildew, chalk, grease and any other surface contaminants before paint application.
 - b. Finish nail holes with nail hole filler or a UV resistant acrylic caulk.
 - c. Paint as specified in Section 09 9113 – Exterior Painting.
 - 1) Use 100 percent acrylic latex or 100 percent acrylic latex with urethane additive paint with a light reflective value (LRV) equal to or greater than 55 units.
 - 2) Follow the paint manufacturer's application recommendations.
- E. PROTECTION
- 1. Protect installed products until completion of project.
 - 2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at perimeter foundation wall and underside of floor slabs.
- B. Batt insulation and vapor retarder in exterior wall and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.
- C. Section 07 21 26 - Blown Insulation: Blown-in, gravity-held fibrous insulation.
- D. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS

- A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- F. ICC-ES AC239 - Acceptance Criteria for Termite-Resistant Foam Plastic; 2008.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Under Concrete Slabs: EPS Expanded polystyrene. board.
- B. Insulation at Perimeter of Foundation: Expanded polystyrene (EPS) board.
- C. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.
- D. Insulation in Wood Framed Ceiling Structure: Batt insulation with paper faced vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 3. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 4. Board Size: 48 inch by 96 inch.
 5. Board Thickness: 2 1/2 inch or as indicated on drawings.
 6. Board Edges: Square.
 7. Products:
 - a. Diversifoam Products: www.diversifoam.com/#sle.
 - b. InsulFoam LLC: www.insulfoam.com/#sle.
- B. Termite-Resistant Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
 1. Termite Resistance: Comply with ICC-ES AC239.
 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 4. Board Size: 48 inch by 96 inch.
 5. Board Thickness: 2-1/2 inch.
 6. Thermal Resistance: R-value of 11, for overall thickness indicated.
 7. Board Edges: Square.
 8. Products:
 - a. Nisus Corporation; Bora-Foam: www.nisuscorp.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BATT INSULATION MATERIALS

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- B. EcoTouch Kraft Faced Batt Insulation for wood framed structure
 1. ASTM C655, Type II Class C preformed formaldehyde free glass fiber batt type insulation
 2. Kraft paper faced one side
 3. ASTM C518
 4. ICC Building Code Construction Classification III, IV, V
 5. Per Rating: 1 perm max per ASTM E96
 6. R-38, 12 1/4" thick, 24" width, 48" length
 7. Products:
 - a. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

- C. Glass Fiber Batt Insulation for Walls: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Formaldehyde Content: Zero.
 - 5. Thermal Resistance: R-value of 20.
 - 6. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
- D. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 - 1. Provide between perimeter wall stud furring facing on one side; with flame spread index of 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 - 3. Thermal Resistance: R-value of 20 .
 - 4. Insulation thickness shall be at minimum 2 inches less the full depth of the joist.
 - 5. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com/#sle.
 - c. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
 - 1. Tape seal joints.
 - 2. Extend sheet full height of joint.
- B. Install boards horizontally on foundation perimeter.
 - 1. Provide board widths to match wall tie coursing
 - 2. Place boards to maximize adhesive contact.
 - 3. Install in running bond pattern.
 - 4. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- E. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.

1. Install boards horizontally from base of foundation to top of insulation.
2. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Coordinate work of this section with construction of air barrier seal specified in Section 07 25 00.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
 1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 3. Cooperate with ABAA testing agency.
 4. Allow access to air barrier work areas and staging.
 5. Do not cover air barrier work until tested, inspected, and accepted.

3.06 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 26
BLOWN INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ceiling and Attic: Blown insulation pneumatically placed into joist spaces through access holes.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation; 2017.
- C. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2017.
- D. ASTM C1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Blown Insulation:
 - 1. CertainTeed Corporation; www.certainteed.com/#sle.
 - 2. GreenFiber; www.greenfiber.com/#sle.
 - 3. Johns Manville; www.jm.com/#sle.
 - 4. Thermafiber, Inc; www.thermafiber.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Applications: Provide blown insulation in attic, exterior walls, and ceiling as indicated on drawings.
- B. Provide blown insulation in accordance with requirements of Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- C. Thermal Resistance [R-value (RSI-value)]: Provided minimum values in accordance with applicable edition of ASHRAE Std 90.1 I-P for envelope requirements of building location and climate zone.
- D. Blown Insulation: ASTM C764, fiberglass type, nodulated for pour and bulk for pneumatic placement.
 - 1. R Value - 38

2.03 ACCESSORIES

- A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.
 - 1. Material: Polyvinyl chloride (PVC).
 - 2. Roof Joist/Truss Spacing: 16 inch (406 mm) on center, nominal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and adjacent materials are dry and ready to receive insulation.

- B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.
- C. Verify spaces are unobstructed to allow for proper placement of insulation.

3.02 INSTALLATION

- A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.
- B. Place insulation against baffles, and do not impede natural attic ventilation to soffit.
- C. Completely fill intended spaces leaving no gaps or voids.
- D. Repair and reseal insulation access ports, and refinish to match adjacent work.

3.03 CLEANING

- A. Remove loose insulation residue.

END OF SECTION

**SECTION 07 25 00
WEATHER BARRIERS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Weather barrier membrane
- B. Seam Tape
- C. Flashing
- D. Fasteners

1.02 REFERENCES

- A. ASTM International
 - 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 - 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 - 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 - 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
 - 8. ASTM E2178; Test Method for Air Permeance of Building Materials
 - 9. AATCC – American Association of Textile Chemists and Colorists
 - a. Test Method 127 Water Resistance: Hydrostatic Pressure Test
 - 10. TAPPI
 - a. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 - b. Test Method T-460; Air Resistance (Gurley Hill Method)

1.03 SUBMITTALS

- A. Refer to Section 01 30 00 Administrative Requirements.
- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
- D. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.
 - 2. Closeout Submittals
 - a. Refer to Section 01 78 00 Closeout Submittals.

1.04 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installer shall have experience with installation of similar weather barrier assemblies under similar conditions.
 - 2. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
 - 3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 Product Requirements.
- B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by system manufacturer.

1.06 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. DuPont; Tyvek HomeWrap; <http://www.construction.tyvek.com>
- B. James Hardie; Hardiewrap; www.jameshardie.com
- C. CertainTeed; Certawrap; www.certainteed.com;

2.02 MATERIALS

- A. Basis of Design: DuPont; spunbonded polyolefin, non-woven, non-perforated, weather barrier.
 - 1. Performance Characteristics:
 - a. Air Penetration: <.004 cfm/ft² at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 - b. Water Vapor Transmission: 56 perms, when tested in accordance with ASTM E96-05, Method A.
 - c. Water Penetration Resistance: 250 cm when tested in accordance with AATCC Test Method 127.
 - d. Basis Weight: 1.8 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 - e. Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
 - f. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882.
 - g. Tear Resistance: 8/6 lbs, when tested in accordance with ASTM D1117.
 - h. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 15

2.03 ACCESSORIES

- A. Seam Tape: 3 inch wide, as distributed by weather barrier manufacturer.
- B. Fasteners:
 - 1. DuPont™ Tyvek® Wrap Caps, as distributed by DuPont: #4 nails with large 1-inch plastic cap fasteners, or 1-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.
 - 2. Masonry tap-con fasteners with DuPont™ Tyvek® Wrap Caps as distributed by DuPont: 2-inch diameter plastic cap fastener.
 - 3. Sealants
 - a. Refer to Section 07 92 05 Joint Sealers
 - b. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
 - c. Products:
 - 1) DuPont™ Residential Sealant
 - 2) Sealants recommended by the weather barrier manufacturer.
 - 4. Adhesive:
 - a. Provide adhesive recommended by weather barrier manufacturer.
 - b. Products:
 - 1) Liquid Nails® LN-109
 - 2) Denso Butyl Liquid
 - 3) 3M High Strength 90
 - 4) SIA 655
 - 5) Adhesives recommend by the weather barrier manufacturer.
 - 5. Primer:
 - a. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
 - b. Products:
 - 1) 3M High Strength 90
 - 2) Denso Butyl Spray
 - 3) SIA 655

- 4) Permagrip 105
 - 5) ITW TACC Sta' Put SPH
 - 6) Primers recommended by the flashing manufacturer
6. Flashing
- a. DuPont™ FlexWrap™, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.
 - b. DuPont™ FlexWrap™ NF, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.
 - c. DuPont™ StraightFlash™, as distributed by DuPont: straight flashing membrane materials for flashing windows and doors and sealing penetrations, masonry ties, etc.
 - d. DuPont™ StraightFlash™ VF, as distributed by DuPont: dual-sided, straight flashing membrane materials for brickmold and non-flanged windows and doors.
 - 1) 5. DuPont™ Thru-Wall Surface Adhered Membrane with Integrated Drip Edge: Thru-Wall flashing
 - 2) membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.)
 - 3) and at transitions between different assembly materials.
 - 4) 6. Preformed Inside and Outside Corners and End Dams as distributed by DuPont: Preformed three-dimensional shapes to complete the flashing system used in conjunction with DuPont™ Thru-Wall
 - 5) Flashing.
 - 6) Flashing.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.02 INSTALLATION – WEATHER BARRIER

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.
- D. Extend bottom roll edge over sill plate interface 2" to 3" minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.
- E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- F. Window and Door Openings: Extend weather barrier completely over openings.
- G. Weather Barrier Attachment:
 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
 2. Attach weather barrier to masonry. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site. Use cladding fasteners as permanent means of attachment.
 3. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.03 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.04 OPENING PREPARATION (FOR USE WITH FLANGED WINDOWS)

- A. Cut weather barrier in an "I-cut" pattern. A modified I-cut is also acceptable.
- B.
 - 1. Cut weather barrier horizontally along the bottom and top of the window opening.
 - 1. From the top center of the window opening, cut weather barrier vertically down to the sill
 - 2. Fold side and bottom weather barrier flaps into window opening and fasten.
 - 3. Cut a head flap at 45-degree angle in the weather barrier membrane at window head to expose 8 inches of sheathing. Temporarily secure weather barrier membrane flap away from sheathing with tape.

3.05 FLASHING

- A. Cut 9-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as recommended by the manufacturer.
- B. Cover horizontal sill by aligning DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
- C. Fan DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.
- D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
- E. Install window according to manufacturer's instructions.
- F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.
- G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.
- H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.
- I. Tape head flap in accordance with manufacturer recommendations.
- J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

3.06 THRU-WALL FLASHING INSTALLATION

- A. Apply primer per manufacturer's written instructions.
- B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.
- C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.
- D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.
- E. Roll flashing into place. Ensure continuous and direct contact with substrate.
- F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.
- G. Trim exterior edge of membrane 1-inch and secure metal drip edge (if used) per manufacturer's written instructions.
- H. Terminate membrane on vertical wall. Terminate into reglet, counterflashing or with termination bar.

- I. Apply sealant bead at each termination.

3.07 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL

- A. Overlap thru-wall flashing with weather barrier by 6-inches.
- B. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.
- C. Seal vertical and horizontal seams with tape or sealing membrane.

3.08 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE

- A. Seal weather barrier to bottom of shelf angle with sealing membrane.
- B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.
- C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.

3.09 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD

- A. Cut flap in weather barrier at window head.
- B. Prime exposed sheathing.
- C. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.
- D. Install end dams bedded in sealant.
- E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.
- F. Apply sealant along thru-wall flashing edges.
- G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.
- H. Tape diagonal cuts of weather barrier.
- I. Secure weather barrier flap with fasteners.

3.10 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection, underlayment, and valley protection.
- C. Associated metal flashings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Roof sheathing.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings.
- C. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2018.
- B. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2019.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2019.
- D. ASTM D3909/D3909M - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules; 2014.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- H. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2018a.
- I. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2012, with Editorial Revision (2015).
- J. NRCA (RM) - The NRCA Roofing Manual; 2018.
- K. NRCA MS104 - The NRCA Steep Roofing Manual; National Roofing Contractors Association; 2001, Fifth Edition, with interim updates.
- L. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- M. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.
- D. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Shingles: 100 sq ft (9.29 sq m) of each type and color.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual.
 1. Maintain one copy of document on site.
- B. Products are Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.

1.06 MOCK-UP

- A. Provide mock-up of 100 sq ft (9.29 sq m), including underlayment.
- B. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

- A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F (7 degrees C).

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.
- D. Provide five year manufacturer's warranty for wind damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Algae Resistant Asphalt Shingles:
 1. Atlas Roofing Corporation; Storm Master Shake High Wind and Impact Resistant Shingles: www.atlasroofing.com/#sle.
 2. GAF; Timberline Ultra HD Shingles with StainGuard Plus: www.gaf.com/#sle.
 3. IKO Industries Inc; Dynasty with ArmourZone: www.iko.com/#sle.
 4. Owens Corning Corp: www.owenscorning.com/#sle.
 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 1. Fire Resistance: Class A, complying with ASTM E108.
 2. Wind Resistance: Class F, when tested in accordance with ASTM D3161/D3161M.
 3. Warranted Wind Speed: Not greater than 60 mph (97 km/h).
 4. Algae Resistant.
 5. Warranty: 30 year
 6. Self-sealing type.
 7. Style: Square.
 8. Color: As selected by Architect.

2.03 SHEET MATERIALS

- A. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil (1 mm) total thickness; with strippable treated release paper and polyethylene sheet top surface.
- B. Underlayment: Self-adhering butyl-rubber sheet complying with ASTM D1970/D1970M; strippable release film.
 1. Reinforcement Layer: Non-woven polyester top surface.
 2. Sheet Thickness: 19 mil (0.48 mm), minimum.
 3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.

5. Water Vapor Permeance: 0.05 perm (0.30 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
 6. Functional Temperature Range: Minus 45 degrees F (42.8 C) to 250 degrees F (121 C).
 7. Ultraviolet (UV) Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of six months.
 8. Manufacturers:
 - a. Protecto Wrap Company; Jiffy Seal Butyl Ice and Water Guard HT:
www.protectowrap.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Flexible Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil (1 mm) total thickness; with strippable treated release paper and polyethylene sheet top surface.

2.04 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8 inch (9.5 mm) head diameter, 12 gage, 0.109 inch (2.77 mm) nail shank diameter, 1-1/2 inch (38 mm) long and complying with ASTM F1667.
- B. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 10 wire gage, 0.1019 inch (2.59 mm) shank diameter, 3/8 inch (9.5 mm) head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch (19 mm) into roof sheathing or decking.
- C. Staples: Standard wire shingle type, of hot dipped zinc coated steel, 16 wire gage, 0.0508 inch (1.29 mm) diameter, 15/16 inch (23.8 mm) crown width, of sufficient length to penetrate through roof sheathing or 3/4 inch (19 mm) into roof sheathing or decking.
- D. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.
- E. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.
- F. Ridge Vents: Corrugated plastic, formed with vent openings that do not permit direct water or weather entry; as manufactured by roof shingle mfg..

2.05 METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.
 1. Form flashings to profiles indicated on drawings.
 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 3. Hem exposed edges of flashings minimum 1/4 inch (6 mm) on underside.
 4. Coat concealed surfaces of flashings with bituminous paint.
- B. Aluminum Sheet Metal: Prefinished aluminum, 26 gage, 0.017 inch (0.43 mm) minimum thickness; PVC coating, color as selected by Architect from mfg.'s full color range.
- C. Bituminous Paint: Acid and alkali resistant type; black color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify that roof deck is of sufficient thickness to accept fasteners.
- C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
- D. Verify roof openings are correctly framed.
- E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch (1.5 mm) as recommended by shingle manufacturer.

- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches (50 mm) and seal with plastic cement, and secure flange with nails spaced 12 inches (305 mm) on center.

3.03 INSTALLATION - EAVE PROTECTION MEMBRANE

- A. Install eave protection membrane from eave edge to minimum 4 ft (1200 mm) up-slope beyond interior face of exterior wall.
- B. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

3.04 INSTALLATION - UNDERLAYMENT

- A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over entire roof area, with ends and edges weather lapped minimum 4 inches (100 mm), stagger end laps of each consecutive layer, and nail in place.
- B. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches (100 mm), stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches (100 mm) over eave protection.
- C. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.05 INSTALLATION - VALLEY PROTECTION

- A. Install valley protection in accordance with SMACNA, Fifth Edition Detail as noted on the Drawings.
- B. Install flexible flashing in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- C. At Exposed Valleys: Install one layer of sheet metal flashing, minimum 24 inches (600 mm) wide, centered over open valley and crimped to guide water flow, weather lap joints minimum 2 inch (50 mm) wide band of lap cement along each edge of first layer, press roll roofing into cement, nail in place minimum 18 inches (450 mm) on center and 1 inch (25 mm) from edges.

3.06 INSTALLATION - METAL FLASHING AND ACCESSORIES

- A. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Weather lap joints minimum 2 inches (50 mm) and seal weather tight with plastic cement.
- C. Secure in place with nails at 12 inches (____ mm) 12 inches (____ mm) on center, and conceal fastenings.
- D. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.07 INSTALLATION - SHINGLES

- A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.
 1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch (125 mm) weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
- C. Project first course of shingles 3/4 inch (19 mm) beyond fascia boards.

- D. Extend shingles 1/2 inch (13 mm) beyond face of gable edge fascia boards.
- E. Extend shingles on one slope across valley and fasten, trim shingles from other slope 2 inches (50 mm) from valley center line to achieve closed cut valley, and concealing valley protection.
- F. Extend shingles on both slopes across valley in a weave pattern and fasten, extend shingles a minimum of 12 inches (300 mm) beyond valley center line to achieve woven valley, and concealing valley protection.
- G. Cap hips with individual shingles, maintaining 5 inch (125 mm) weather exposure, and place to avoid exposed nails.
- H. After installation, place one daub of plastic cement, one inch (25 mm) diameter under each individual shingle tab exposed to weather, to prevent lifting.
- I. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.
- J. Complete installation to provide weather tight service.

3.08 PROTECTION

- A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural roofing system of preformed steel panels.

1.02 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Roof framing and purlins.
- B. Section 06 10 00 - Rough Carpentry: Roof sheathing.
- C. Section 06 15 00 - Wood Decking: Roof sheathing.
- D. Section 07 21 00 - Thermal Insulation: Rigid roof insulation.
- E. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM A463/A463M - Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process; 2015, with Editorial Revision (2020).
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- E. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2018.
- G. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- J. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- K. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 2011 (Reapproved 2018).
- L. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; 2016.
- M. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018.
- N. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2012, with Editorial Revision (2015).
- O. ICC-ES AC207 - Acceptance Criteria for Polypropylene Roof Underlayments; 2012, with Editorial Revision (2015).
- P. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Storage and handling requirements and recommendations.
 2. Installation methods.
 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.
- F. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of twenty years from Date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Roof Panels:
 1. ATAS International, Inc; Colonial Seam: www.atas.com/#sle.
 2. Berridge Manufacturing Company; M-Panel: www.berridge.com/#sle.
 3. Petersen Aluminum Corporation; PAC T-250 Panel: www.pac-clad.com/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL ROOF PANELS

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 1. Steel Panels:
 - a. Aluminum-coated steel complying with ASTM A463/A463M; minimum Type 2 T2-65 coating.

- b. Steel Thickness: Minimum 24 gauge (0.024 inch).
- 2. Profile: Standing seam, with minimum 1 3/4 inch seam height; concealed fastener system for field seaming with special tool.
- 3. Texture: Smooth.
- 4. Length: Maximum possible length to minimize lapped joints. Where lapped joints are unavoidable, space laps so that each sheet spans over three or more supports.
- 5. Width: Maximum panel coverage of 16 inches.

2.03 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 FABRICATION

- A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.05 FINISHES

- A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat aluminum coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss to match sample.

2.06 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
 - 1. Downspouts: Open face, rectangular profile.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
 - 3. Seam Sealant: Factory-applied, non-skinning, non-drying type.
- D. Thermal Insulation: Provide flexible blanket, rigid, or semi-rigid type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame spread index of 50, per ASTM E84; for installation using spacer blocks.
- E. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
 - 1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
 - 2. Minimum Requirements: Comply with requirements of ICC-ES AC207 for non-self-adhesive sheet.
 - 3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 - 4. Flammability: Minimum of Class A, when tested in accordance with ASTM E108.
 - 5. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
 - 6. Water Vapor Permeance: Vapor retarder; maximum of 1 perm, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).

7. Performance: Meet or exceed requirements for ASTM D226/D226M, Type II asphalt-saturated organic felt.
 8. Liquid Water Transmission: Passes ASTM D4869/D4869M.
 9. Functional Temperature Range: Minus 70 degrees F to 212 degrees F.
 10. Fasteners: As specified by manufacturer and building code qualification report or approval.
 11. Manufacturers:
 - a. System Components Corporation, Inc; FelTex: www.systemcomponents.net/#sle.
- F. Underlayment: Self-adhering polymer-modified sheet; 20 mil total thickness; with strippable siliconized release film on bottom side and slip resistant and UV-stable facing on top side.
1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 2. Water Vapor Permeance: 30 perm, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
 3. Functional Temperature Range: From minus 40 degrees F to 250 degrees F.
 4. Manufacturers:
 - a. VaproShield, LLC; SlopeShield Plus Self-Adhered: www.vaproshield.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Coordinate installation of waterproof membrane over roof sheathing with 06 10 00.
- D. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- F. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 2. Install roofing system with exposed fasteners prefinished to match panels.
 3. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Install roofing felt and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of

metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.

- D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
 - 1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
 - 2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
 - 3. Provide sealant tape or other approved joint sealer at lapped panel joints.
 - 4. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.
- E. Insulation: Install insulation between roof covering and supporting members to present a neat appearance. Fold, staple, and tape seams unless otherwise approved by Architect.

3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 07 46 46
FIBER-CEMENT SIDING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber-cement siding and trim boards.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Siding substrate.
- B. Section 07 25 00 - Weather Barriers: Weather barrier under siding.
- C. Section 07 90 05 - Joint Sealers
- D. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- D. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
- D. Installer's Qualification Statement.
- E. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- F. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.
- G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Provide multi-year manufacturer warranty as indicated under Siding article sub-heading "Warranty".

- D. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including air/vapor barrier and attachments, framing, and exterior panels) to provide 10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions.
www.edacontractors.com/#sle

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Style: Standard lap style.
 2. Texture: Smooth.
 3. Length: 12 ft (3.7 m), nominal.
 4. Width (Height): 7-1/4 inches (184 mm).
 5. Thickness: 5/16 inch (8 mm), nominal.
 6. Finish: Factory applied primer.
 7. Color: As indicated on drawings.
 8. Color: As selected by Architect from manufacturers full range of available colors.
 9. Warranty: 50 year limited; transferable.
 10. Manufacturers:
 - a. Allura, a division of Plycem USA, Inc: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
 - c. Nichiha USA, Inc: www.nichiha.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Texture: Smooth.
 2. Length (Height): 96 inches (2400 mm), nominal.
 3. Width: 48 inches (1220 mm).
 4. Thickness: 5/16 inch (8 mm), nominal.
 5. Finish: Factory applied primer.
 6. Warranty: 50 year limited; transferable.
 7. Manufacturers:
 - a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Shingle Panels: Panels giving appearance of multiple shingles made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Style: Random width, straight edge.
 2. Texture: Wood grain textured.
 3. Length: 48 inches (1220 mm).
 4. Width (Height): 7 inches (178 mm).
 5. Thickness: 1/4 inch (6 mm), nominal.
 6. Finish: Factory applied primer.
 7. Color: As indicated on drawings.
 8. Warranty: 50 year limited; transferable.
 9. Manufacturers:
 - a. Allura, a division of Plycem USA, Inc: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
 - c. Nichiha USA, Inc: www.nichiha.com/#sle.

- d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Soffit Panels: Smooth panels of same material and finish.
- E. Vented Soffit Panels: Vented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Texture: Smooth.
 - 2. Length: 96 inches (2400 mm), nominal.
 - 3. Width: 48 inches (1220 mm).
 - 4. Thickness: 5/16 inch (8 mm), nominal.
 - 5. Finish: Factory applied primer.
 - 6. Color: As selected by Architect from manufacturers full range of available colors.
 - 7. Manufacturer: Same as siding.

2.02 ACCESSORIES

- A. Trim: Same material and texture as siding and soffit.
 - 1. Finish: Factory applied primer.
 - 2. Thickness: 3/4"
 - 3. Width: as follows:
 - a. Battens: 2-1/2" wide.
 - b. Trim: as indicated on drawings.
- B. Fiber Cement Siding Metal Trim: Extruded aluminum alloy 6063-T5 temper.
 - 1. Dimension and Layout: As indicated on drawings.
 - 2. Finish: Clear anodized.
- C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch (32 mm).
- D. Exterior Soffit Vents: One piece, perforated, ASTM B221 (ASTM B221M), 6063 alloy, T5 temper, aluminum, with flat panel edge and manufactured especially for soffit application, and provide continuous vent in applications required in drawings where vented soffit panels are not used.
- E. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.
- F. Finish Paint: Latex house paint acceptable to siding manufacturer; primer recommended by paint manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that weather barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Install Sheet Metal Flashing:
 - 1. Above door and window trim and casings.
 - 2. Above horizontal trim in field of siding.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.

2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 3. Use trim details indicated on drawings.
 4. Touch up field cut edges before installing.
 5. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
 - C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
 - D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
 - E. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
 - F. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, porches, and other surfaces where water may collect.
 - G. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area specified.
 - H. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.
 - I. Finish Painting: Within one week after installation, paint siding and trim with one coat primer and two coats finish paint. Refer to Section 09 91 13.

3.04 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 07 31 13 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.
- C. Section 07 71 23 - Manufactured Gutters and Downspouts.
- D. Section 07 90 05 - Joint Sealers.

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- G. CDA A4050 - Copper in Architecture - Handbook; current edition.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; plain finish shop pre-coated with modified silicone coating.

1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 2. Color: As selected by Architect from manufacturer's full colors.
- B. Copper: ASTM B370, cold rolled 16 oz/sq ft (0.5 mm) thick; 110 Copper finish by Firestone.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
- E. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- G. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.04 FIELD QUALITY CONTROL

- A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-finished aluminum gutters, downspouts ad splash blocks.

1.02 RELATED REQUIREMENTS

- A. Section 07 31 13: Asphalt Shingles.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim.
- C. Section 09 91 13 - Exterior Painting: Field painting of metal surfaces.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- H. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Comply with applicable code for size and method of rain water discharge.
- C. Maintain one copy of each document on site.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- D. Product Data: Provide data on prefabricated components.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gutters and Downspouts:

2.02 MATERIALS

- A. Polyvinyl Chloride (PVC): ASTM D2665, virgin vinyl, SDR 35 pipe and fittings, high impact type, colorfast; color as selected.
- B. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch (0.8 mm) thick.
 - 1. Finish: Plain, shop pre-coated with modified silicone coating.
 - 2. Color: As indicated.

2.03 COMPONENTS

- A. Gutters: Profile as indicated on the drawings
- B. Downspouts: CDA Rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: In accordance with CDA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 ACCESSORIES

- A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.
- B. Downspout Boots: PVC.

2.05 FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.06 FINISHES

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 1/4" per 10'-0" minimum.
- C. Connect downspouts to downspout boots at 6 inches above grade. Seal connection watertight.

D. Connect downspouts to storm sewer system. Grout connection watertight.

END OF SECTION

**SECTION 07 84 00
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire stopping and accessories.
- B. Division 22 : Plumbing work requiring fire stopping.
- C. Division 23 : Mechanical work requiring fire stopping.
- D. Division 26 : Electrical work requiring fire stopping.

1.02 REFERENCES

- A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
- C. ASTM E814 - Test Method of Fire Tests of Through- Penetration Firestops.

1.03 PERFORMANCE REQUIREMENTS

- A. Fireproofing Materials: ASTM E119 to achieve a fire rating as noted on Drawings.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F
- B. Provide ventilation in areas to receive solvent cured materials.

1.08 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.09 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.10 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a.
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015a.

- G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- I. ITS (DIR) - Directory of Listed Products; current edition.
- J. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- K. FM (AG) - FM Approval Guide; current edition.
- L. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.
- M. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- N. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- O. UL (DIR) - Online Certifications Directory; Current Edition.
- P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.11 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.12 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - 3. Verification of minimum three years documented experience installing work of this type.
 - 4. Verification of at least five satisfactorily completed projects of comparable size and type.
 - 5. Licensed by local authorities having jurisdiction (AHJ).

1.13 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. If accepted, mock-up will represent minimum standard for the Work.
- C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.14 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
 - 3. Hilti, Inc: www.us.hilti.com/#sle.
 - 4. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
 - 5. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURERS

- A. 3-M Fire Protection Products.
- B. Substitutions: Under provisions of Section 01 60 00.

2.03 MATERIALS

- A. 3m Fire Barrier CP 25WB+ Caulk: Intumescent latex/water-based caulk. For use around horizontal steel pipe penetrations.
- B. 3M FireDam Spray: Sprayable water based coating. For head-of-wall firestopping
- C. 3M Fire Barrier 2000 and 2003 Silicone Sealant: One-part caulking grade sealant. Available in nonslump (2000) and self-leveling (2003). Requires mineral wool backing. For top-of-wall/head-of-wall joints subject to vibration and building movement.
- D. 3M Fire Barrier 2001 Silicone RTV Foam: Two-part, liquid-silicone elastomer that foams in place when mixed. Requires mineral wool backing. For large and complex penetrations.
- E. 3M Ultra Plastic Pipe Device: One-piece metal collar with Intumescent material. For use around plastic pipe.
- F. 3M Interam Ultra GS: Intumescent material. Requires RC-1 Restricting Collar. For use around plastic pipe penetrations.
- G. 3M Fire Barrier FS-195+ Wrap/Strip: One-part organic/inorganic elastomeric strip with foil on one side. Material is Intumescent. Material is re-enterable. For use around plastic pipe. Can be cut to irregular shapes.
- H. 3M Fire Barrier RC-1 Restricting Collar: 28-gauge steel collar. Works in conjunction with 3M FS-195+ Wrap/Strip or 30 Interam Ultra GS. For use around plastic pipes larger than 4 inches in diameter.
- I. 3M Fire Barrier Moldable Putty+: One-part, 100% solid Intumescent moldable putty. For use around construction gaps, and telecommunications wiring/cabling.
- J. 3M Fire Barrier Mortar: Lightweight cementitious firestop. Bonds to concrete, metals, wood, plastic and cable jacketing. For use in concrete floor steel penetrations.
- K. 3M Graphite Intumescent Seal (GIS): Thin fiber/latex mat adhesive backed flexible intumescent strip. For firestopping doors and window panels.
- L. 3M InteramT-49 Tape: 3-mil aluminum foil tape. For sealing cut edges of 3M Interam Mats and 3M Fire Master Duct Wrap.
- M. 3M Fire Master Duct Wrap: Refractory ceramic fiber blanket encapsulated with aluminum-foil scrim. Zero clearance to combustibles. Oil and water Resistant. Low thermal conductivity. For

use to enclose kitchen exhaust ducts and fire-rated air duct work. Used in conjunction with 3M fire barrier 2000+ Silicone sealant. Requires 3M Interam t-49 tape

- N. 3M Fire Master Plenum Wrap: High temperature insulation blanket fully encapsulated with aluminum-foil scrim. Oil and water resistant. Requires tie wire, filament tape, or aluminum foil tape for proper installation. For use in enclosing plastic piping in fire rated plenums. Requires on-inch clearance for adjacent material.

2.04 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.05 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
- B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.06 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

- A. Gypsum Board Walls:
 - 1. Wall to Wall Joints That Have Movement Capabilities (Dynamic):
 - a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.07 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
 - 1. 1 Hour Construction: UL System W-L-0020; Specified Technologies Inc. Composite Sheet.
 - 2. 1 Hour Construction: UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - 3. 1 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - 4. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
- B. Penetrations By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
 - c. 1 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
 - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:

- a. 1 Hour Construction: UL System W-L-1042; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
 - b. 1 Hour Construction: UL System W-L-1049; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
 - c. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - d. 1 Hour Construction: UL System W-L-1090; Specified Technologies Inc. LC Endothermic Firestop Sealant.
 - e. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - f. 1 Hour Construction: UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
 - g. 1 Hour Construction: UL System W-L-1477; Specified Technologies Inc. EZ Firestop Grommet.
 - h. 1 Hour Construction: UL System W-L-1506; Hilti CFS-D Firestop Cable Disc.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
- a. 1 Hour Construction: UL System W-L-2048; Specified Technologies Inc. SSW wrap strips.
 - b. 1 Hour Construction: UL System W-L-2074; Specified Technologies Inc. SSC collars.
 - c. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
 - d. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - e. 1 Hour Construction: UL System W-L-2237; Specified Technologies Inc. LCC Intumescent Firestop Collars.
 - f. 1 Hour Construction: UL System W-L-2241; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
 - g. 1 Hour Construction: UL System W-L-2243; Specified Technologies Inc. SSW wrap strips.
 - h. 1 Hour Construction: UL System W-L-2493; Specified Technologies Inc. RTC range-taking collar.
4. Electrical Cables Not In Conduit:
- a. 1 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
 - b. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
 - c. 1 Hour Construction: UL System W-L-3076; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
 - d. 1 Hour Construction: UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop pillows.
 - e. 1 Hour Construction: UL System W-L-3135; Specified Technologies Inc. SSP Firestop Putty.
 - f. 1 Hour Construction: UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
 - g. 1 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - h. 1 Hour Construction: UL System W-L-3255; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
 - i. 1 Hour Construction: UL System W-L-3256; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
 - j. 1 Hour Construction: UL System W-L-3265; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.

- k. 1 Hour Construction: UL System W-L-3303; Specified Technologies Inc. Ready Split Sleeve.
 - l. 1 Hour Construction: UL System W-L-3306; Specified Technologies Inc. EZ-Path Series 44 Fire-Rated Pathway.
 - m. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
 - n. 1 Hour Construction: UL System W-L-3350; Specified Technologies Inc. LC Endothermic Firestop Sealant.
 - o. 1 Hour Construction: UL System W-L-3357; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - p. 1 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready Split Sleeve.
 - q. 1 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready-Sleeve.
 - r. 1 Hour Construction: UL System W-L-3369; Specified Technologies Inc. EZ Firestop Grommet.
 - s. 1 Hour Construction: UL System W-L-3370; Specified Technologies Inc. EZ Firestop Grommet.
 - t. 1 Hour Construction: UL System W-L-3374; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - u. 1 Hour Construction: UL System W-L-3376; Specified Technologies Inc. Ready-Sleeve.
 - v. 1 Hour Construction: UL System W-L-3377; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
 - w. 1 Hour Construction: UL System W-L-3377; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - x. 1 Hour Construction: UL System W-L-3378; Specified Technologies Inc. EZ Firestop Grommet.
 - y. 1 Hour Construction: UL System W-L-3379; Specified Technologies Inc. EZ Firestop Grommet.
 - z. 1 Hour Construction: UL System W-L-3390; Specified Technologies Inc. EZ-Path Series 44 Fire-Rated Pathway.
 - aa. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.
 - ab. 1 Hour Construction: UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.
5. Insulated Pipes:
- a. 1 Hour Construction: UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - c. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
 - d. 1 Hour Construction: UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
 - e. 1 Hour Construction: UL System W-L-5273; Specified Technologies Inc. LC Endothermic Firestop Sealant.
 - f. 1 Hour Construction: UL System W-L-5298; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

2.08 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions under provisions of Section 01 20 00.
- B. Verify that openings are ready to receive the Work of this Section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter, which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material leakage.

3.03 APPLICATION

- A. Apply primer and materials in accordance with manufacturer's instructions if required.
- B. Apply firestopping material in sufficient thickness to achieve rating required by each rating requirement.
- C. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
- D. Remove dam material after firestopping material has cured. Dam material to remain.
- E. Comply with all manufacture requirements for UL listing specified.

3.04 CLEANING

- A. Clean Work under provisions of Section 01 70 00.
- B. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 50 00.
- B. Protect adjacent surfaces from damage by material installation.

3.06 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.07 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.08 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.09 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.10 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.11 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 90 05
JOINT SEALERS

PART ONE - GENERAL

1.01 RELATED DOCUMENTS

- A. General Provisions of the Contract, including General and Supplementary Conditions, and Division 01 specification sections, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. Labor, materials, equipment, and services necessary to provide sealants.
- B. The required applications of sealants and caulking include, but are not necessarily limited to, the following general locations:
 - 1. Flashing reglets and retainers.
 - 2. Exterior wall joints.
 - 3. Masonry control joints, exterior and interior.
 - 4. Cracks between wood and masonry.
 - 5. Isolation joints, between structure and other elements.
 - 6. Joints at penetrations of walls, decks, and floors by piping and other services and equipment.
 - 7. Joints between items of equipment and other construction.

1.03 QUALITY ASSURANCE

- A. Obtain elastomeric materials from only manufacturers who will, if required, send a qualified technical representative to project site, for the purpose of advising the Installer of proper procedures and precautions for the use of the materials.
- B. Installer: A firm with a minimum of 5 years successful experience in the application of the types of materials required, and who agrees to employ only skilled tradesmen for the work.

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit copies of manufacturer's specifications, recommendations, and installation instructions for each type of sealant and associated miscellaneous material required. Include manufacturer's published data, letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.
- B. Samples for Initial Selection Purposes: Submit manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for Verification Purposes: Provide samples of each type and color of joint sealer required. Install joint sealer samples in 1/2" wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealers.
- D. Guarantee: Submit copies of written 2 year guarantee agreeing to repair or replace sealants which fail to perform as air-tight and water-tight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any manner not clearly specified by submitted manufacturer's data, as an inherent quality of the material for the exposure indicated.

1.05 JOB CONDITIONS

- A. Pre-Installation Meeting: At the Contractor's direction, the Installer, Architect, sealant manufacturer's representative, and other trades involved in coordination with sealant work shall meet with the Contractor at the project site to review the procedures and time schedule proposed for installation of sealants in coordination with other work. Review each major sealant application required on the project.
- B. Condition of Other Work: The Installer must examine the joint surfaces, backing, and anchorage of units forming sealant rabbet, and the conditions under which the sealant work is to

be performed, and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work and performance of the sealants. Do not proceed with the sealant work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

- C. Weather Conditions: Do not proceed with installation of sealant under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the low third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures. Coordinate time schedule with Contractor to avoid delay of project.
- D. Statement of Non-Compliance: Where it is necessary to proceed with the installation of sealants under conditions which do not fully comply with the requirements (because of time schedule or other reasons which the Contractor determines to be crucial to the project), prepare a written statement for the Owner's record (with copies to the Contractor and Architect) indicating the nature of the non-compliance, the reasons for proceeding, the precautionary measures taken to ensure the best possible work, and the names of the individuals concurring with the decision to proceed with the installation.

1.06 GENERAL PRODUCT REQUIREMENTS

- A. Colors: Wherever sealant is exposed to view, provide colors as selected by Architect from manufacturer's standard or custom colors. Horizontal joints may be of differing colors from vertical joints. Verify all locations' colors with Architect.
- B. Hardnesses shown and specified are intended to indicate the general range necessary for overall performance. The manufacturer's technical representative shall determine the actual hardness recommended for the conditions of installation and use. Upon request, Architect will furnish information concerning anticipated joint movement related to actual joint width and installation temperature. Except as otherwise indicated or recommended, provide compounds within the following ranges of hardness (Shore A, fully cured, at 75 degrees F.):
 - 1. 5 to 20 for high percentage of movement and minimum exposure to weather and abrasion (including no exposure to vandalism).
 - 2. 15 to 35 for moderate percentage of movement and moderate exposure to weather and abrasion.
 - 3. 30 to 60 for low percentage of movement and maximum exposure to weather and abrasion (including foot traffic on horizontal joints).
- C. Modulus of Elasticity: For joints subject to movement, either thermal expansion or dynamic movement, provide elastomeric sealants which have the lowest modulus of elasticity which is consistent with the exposure to abrasion or vandalism. For horizontal joints subject to traffic provide sealants with high modulus of elasticity, as required to withstand indentation by stiletto heels. Comply with manufacturer's recommendations wherever no other requirements are indicated.
- D. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Multi-Part Urethane
 - 1. Provide at all exterior areas, all toilets, kitchens, janitor's closets, areas subject to dampness, and interior expansion and control joints.
 - 2. Provide multi-part sealant complying with ASTM C929, Type M, Grade NS, Class 50.
 - 3. Products complying with the requirements include:
 - a. Pecora Corp: Dynatrol II
 - b. Tremco Inc: Dymeric 240

- c. BASF.: Sonolastic 150 VLM
- B. Two-Component Polyurethane Sealant for Traffic Joints
 - 1. Provide at all interior and exterior joints in traffic areas.
 - 2. Provide polyurethane-based, 2-part elastomeric sealant, complying with FS TT-S-00227E, Class A, Type I (self-leveling) unless Type II (non-sag) is recommended by manufacturer for the application shown.
 - 3. Products complying with the requirements include the following:
 - a. Pecora: Urexpan NR-200
 - b. BASF.: Sonomeric 1
 - c. Tremco: THC-900
- C. One-Part Silicone Building Sealant (High Movement)
 - 1. Provide at all vertical exterior joints between precast panels and all other exterior joints subject to high movement as indicated on the Drawings. (Silicone sealant shall be backed by a 20 year manufacturer's warranty on material.)
 - 2. Provide one-part silicone sealant, complying with ASTM C-290, Type S, Grade NS, Class 25, Use NT, M, G, A, and O. Sealant shall have capability of +100% and -50% joint movement as tested by Federal Specification TT-S-001543.
 - 3. Products Complying with requirement include:
 - a. Tremco: Spectrum 2
 - b. Pecora: 890 Silicone
- D. Fire Resistant Joint Sealants: Refer to Section 078400 "Firestopping".
- E. Acrylic-Latex Sealant
 - 1. Provide at all interior areas not specified above.
 - 2. Provide manufacturer's standard, one part, non-sag, acrylic, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than plus or minus 7.5%.
 - 3. Products complying with the requirements include:
 - a. Tremco: Tremco Acrylic Latex Sealant
 - b. Pecora Corp: AC-20
 - c. Sonneborn-Degussa: Sonolac
 - d. W. R. Meadows: Easaply

2.02 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Provide the type of joint cleaning compound recommended by the sealant manufacturer, for the joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.
- D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.
- E. Compressible Waterstops: Provide Wil-Seal 600, manufactured by Illbruck.

PART THREE - EXECUTION

3.01 JOINT SURFACE PREPARATION

- A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coating, moisture and other substances which would interfere with bond of sealant compounds.
- B. For elastomeric sealant, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion) has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with caulking bond and performance. Etch with 5% solution of muriatic acid, neutralize with dilute ammonia solution, rinse thoroughly with water, and allow to dry before sealant installation.

3.02 INSTALLATION

- A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.
- B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealant to spill or migrate onto adjoining surfaces.
- C. Install sealant backer rod for liquid elastomeric sealant, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- D. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.
- E. Employ only proven installation techniques, which will ensure that sealant will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealant to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.
 - 1. For joints sealed with elastomeric sealant and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
 - 2. For normal moving joints sealed with elastomeric sealant, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
 - 3. For joints sealed with non-elastomeric sealant compounds fill joints to a depth in the range of 75% to 125% of joint width.
- G. Spillage: Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textures such as exposed aggregate panels. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant.
- H. Remove excess and spillage of sealant promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes.
- I. Cure sealants in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

- J. The Installer shall advise the Contractor of procedures required for the curing and protection of sealants during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Owner's acceptance.

3.03 TESTS FOR PERFORMANCE

- A. After nominal cure of exterior joint sealants which are exposed to the weather, test for water leaks. Flood the joint exposure with water directed from a 3/4" garden hose held perpendicular to wall face, 2'-0" from joint, connected to a water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 ft. per min.
- B. Test approximately 5% of total joint system, in locations which are typical of every joint condition, and which can be inspected easily for leakage on opposite face. Conduct test in the presence of the Architect's representative, who will determine the actual percentage of joints to be tested and the actual period of exposure to water from the hose, based upon the extent of observed leakage, or lack thereof.
- C. Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as directed.

END OF SECTION

SECTION 08 11 50
STEEL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steel exterior entrance doors.
- B. Glazing.

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 08 16 00 - Molded Composite Doors
- C. Section 09 21 16 - Gypsum Board Assemblies.

1.03 REFERENCES

- A. American Architectural Manufacturer Association (AAMA):
 - 1. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
 - 2. AAMA 506; Voluntary Specifications for Hurricane and Impact and Cycle Testing of Fenestration Products.
- B. ASTM International (ASTM):
 - 1. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Doors by Uniform Static Pressure Difference.
 - 3. ASTM E331 - Standard Test Method for Water Penetration of Exterior Doors by Uniform Static Air Pressure Difference.
 - 4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 - 5. ASTM E1886 - Standard Test Method for Performance of Exterior Doors by Missile(s) and Exposed to Cyclic Pressure Differentials.
 - 6. ASTM E1996 - Standard Specification for Performance of Exterior Doors by Windborne Debris in Hurricanes.
- C. National Fenestration Rating Council (NFRC):
 - 1. NFRC 100 - Procedure for Determining Fenestration Thermal Properties.
 - 2. NFRC 200 - Solar Heat Gain Coefficient and Visible Transmittance.
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 252 - Standard Methods of Fire Tests of Doors Assemblies.
- E. Underwriters Laboratories, Inc. (UL)
 - 1. UL 10B - Standard for Fire Test of Door Assemblies.
 - 2. UL 10C - Standard for positive Pressure Fire Tests of Doors Assemblies.
- F. Uniform Building Code Standard 7-2 (UBC):
 - 1. UBC 7-2 - Fire Tests of Door Assemblies. (Note: Neutral pressure testing standard).
 - 2. UBC 7-2 - Fire Test of Door Assemblies. (Note: Positive pressure testing standard).
- G. Underwriters' Laboratories of Canada (ULC):
 - 1. CAN/ULC S104 - Standard Method for Fire Tests of Door Assemblies.
- H. Window & Door Manufacturers Association (WDMA):
 - 1. WDMA I.S.4 - Water Repellent Preservative Non-Pressure Treatment for Millwork.
 - 2. Sponsored Hallmark Certification Program.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Submit shop drawings indicating details of construction, flashings and relationship with adjacent construction.
- D. Verification Samples: For each factory-finished product specified, two samples, minimum size 6 in (150 mm) square, representing actual finishes.
- E. Quality Assurance Submittals:
 1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
 2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
- F. Closeout Submittals: Refer to Section 01 78 00 - Closeout Submittals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2 years installing similar assemblies.
- B. Certifications: NAMI certification label indicating assemblies meet the design requirements.
- C. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
 1. Mock-ups shall incorporate surrounding construction, including wall assembly fasteners, flashing, and other related accessories installed in accordance with manufacturer's approved installation methods.
 2. Do not proceed with remaining work until workmanship is approved by Architect.
 3. Rework mock-up as required to produce acceptable work.
 4. At Substantial Completion, approved mockups may become part of completed Work.
 5. Demolish mockups and remove from site.
- D. Pre-installation Meeting: Conduct pre-installation meeting on site two weeks prior to commencement of installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
 1. Protect from damage and exposure to direct sunlight during storage.
 2. Store in a dry, well-ventilated area off the floor.
 3. During storage, do not remove paper or cardboard placed between products for shipment.
 4. Store in a humidity and temperature controlled facility. Recommended conditions: 30 to 50 percent relative humidity and 50 to 90 degrees F (10 to 32 degrees C).
- C. Handling: Handle with clean hands and equipment. Lift and carry the products when moving them. Do not drag across one another.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions; temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Install only in vertical walls and when conditions are dry. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 1. Door Slab: 10 Years.
 2. Door System: 10 Years.
 3. Auralast Frame: Lifetime.

4. Steel Frame: See manufacturers separate warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturer: JELD-WEN Incorporated; 440 South Church Street, Suite 400, Charlotte, NC 28202; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email: mailto:architectural_inquiries@jeld-wen.com; Web: <http://www.jeld-wen.com/>.
- B. Substitutions: Substitutions as approved by Architect
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.02 STEEL ENTRANCE DOORS

- A. Basis of Design: Contours Steel Doors as manufactured by Jeld Wen Incorporated or approved equal.
 1. Panel Doors: CC-30, CT-60, 1-Panel Flat, 2-Panel Square Top Flat, Craftsman 3-Panel Flat.
 2. Paneled and Glass doors: CT-607PM, SP-607DG-LE for Community Building.
 3. Paneled and Glass with Fixed External Grille Doors: CC-866FG6, CC-866FG6LE, CT-607FG12, CT-607FG6, CT-607FG4LE
 4. Options
 - a. Fixed Grilles: Standard style, 5/8 in (16 mm) bar with white finish.
 - b. Simulated Divided Lites: Craftsman style, 7/8 in (22 mm) bar with white finish.
 - c. Grilles Between the Glass:
 - d. Flat style, internal muntin, 5/8 in (16 mm) bar:
 - 1) Finish: Architect to select from full color range.
 - e. Prairie style, 5/8 in (16 mm) bar:
 - 1) Finish: Architect to select from full color range.
 - 2) Craftsman Shelf: Optional Shelf on all Craftsman styles.
- B. Performance Requirements:
 1. Fire-Rated Door Assemblies: Meet or exceed fire-protection ratings indicated when tested in accordance with the following: NFPA 252, UL 10B, UL 10C, and CAN/ULC S104, and UBC 7-2. Provide doors complying with specified requirements, based on testing manufacturer's doors representative of those specified: AAMA 1304, ASTM E283, ASTM E330, and ASTM E331.
 2. Structural Design Pressure: Provide doors capable of complying with requirements indicated:
 - a. As indicated on drawings.
 - b. Impact (Windborne-Debris) Resistance: Capable of resisting impact, in accordance with ASTM E1886 and ASTM E1996.
 - 1) Provide doors tested in accordance with FBC Section 1626.
 - 2) Provide doors tested in accordance with FBC, TAS 201, TAS 202 and TAS 203.
- C. Materials:
 1. Wood Frames: Western Pine.
 - a. Preservative treated with AuraLast in accordance with WDMA I.S.4.
 - b. Steel Skins: Galvanized steel. 0.0195 in (0.495 mm) plus or minus 2 percent.
 - c. Steel Skins: Galvanized steel. 0.0175 in (0.444 mm) plus or minus 2 percent.
 - d. Stiles and Rails:
 - 1) Wood Edge Construction: 1 in (25.4 mm) Laminated Veneer Lumber (LVL).
 - 2) Steel Edge Construction: Galvanized Steel; 0.028 in (0.7 mm) continuous roll-formed steel.
 - e. Core: Custom-fitted Polystyrene.
 - f. Thickness: 1-3/4 in (44 mm).
 - 1) Fire Rating: As/if indicated in drawings.

- g. Edge Construction: Steel.
- D. Door Design:
 1. Door Surface: Smooth.
 2. Door Shape: Squared Top.
 3. Door Style: Solid Paneled, Paneled and Glass.
 4. Face Pattern: 1-Panel Flat, 2-Panel Square Top Flat, Craftsman 3-Panel Flat
 5. Bottom Rail: 8-5/8 (225 mm) (Standard); ADA, 10-1/8 in (257 mm).
 6. Panel Profile: Beaded; Craftsman; Flat Panel.
 7. Finish: Two-coats, low-sheen, baked-on enamel primer.
 8. Transom: as indicated on drawings.
 9. Hardware: None. Prep door for owner supplied hinge and lockset.
 - a. Hardware Finish: Satin Nickel.

2.03 PREHUNG HARDWOOD DOOR SYSTEMS

- A. Profile: System 01, Single Door
- B. Jamb:
 1. Material: Solid pine Auralast wood.
 2. Profile: Rabbeted.
 3. Width: As selected by Architect/required by drawings and door schedule: 4-9/16 in (116 mm); 5-1/4 in (133 mm); 6-9/16 in (167 mm).
- C. Casing: As selected by Architect.
- D. Hinges: Solid brass concealed-bearing.
 1. Finish: Satin Nickel.
- E. Sills: Aluminum with Polished Aluminum Finish.

2.04 GLAZING

- A. Door Glazing:
 1. Clear Glass: Clear Low-E, provide tempered glazing as required.

2.05 CONSTRUCTION ACCESSORIES

- A. Flashing: Refer to Section 04 20 00 - Unit Masonry.
- B. Flashing: Refer to Section 07 62 00 - Flashing and Sheet Metal.
- C. Sealants: Refer to Section 07 90 05 - Joint Sealers.
- D. Sealants: Manufacturer recommended sealants to maintain watertight conditions.

2.06 FABRICATION

- A. Construction: One-piece of polystyrene is custom fitted in standard wood stile and rail frame. Back of steel skin is coated with epoxy primer before attachment to core and frame.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect doors prior to installation. Verify doors are suitable for installation
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.
- B. Install Jamb Assembly:
 1. Caulk sill along outside edge and 1/2 in (13 mm) in from edge of subfloor.
 2. Set door unit into center of opening and tack in place.
 3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.
 4. Shim and fasten top of unit where sidelite joins door jamb.
 5. Fasten hinge side jamb to studs.

6. Verify door opens freely and weatherstrip meets door evenly.
 7. Verify door sweep contacts threshold evenly.
 8. Fasten latch side jamb to studs.
- C. Install Transom:
1. Apply caulk on top of door head jamb.
 2. Set transom jamb on door head jamb and fasten.
 3. Shim transom straight. Inspect transom for square, level and plumb.
 4. Fasten transom to studs.
- D. Caulk outside perimeter of door unit between brickmold and wall face, along front side of threshold, and between jamb sides and threshold.

3.03 PROTECTION

- A. Protect installed doors from damage.

END OF SECTION

SECTION 08 16 00
MOLDED COMPOSITE DOORS

P1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior Molded Doors: Passage Doors and Bifold Doors.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
 - 2. NFPA 80: Standard Methods for builders' hardware to be used in fire rated swing doors.
- C. Underwriters Laboratories, Inc. (UL):
 - 1. UL10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure testing standard).
 - 2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.
 - 3. GREEN GUARD: CA 01350, Indoor Air Quality (IAQ) Testing
- D. Underwriters' Laboratories of Canada (ULC).
 - 1. CAN4-S104: Standard Method for Fire Tests of Door Assemblies.

1.03 DESIGN REQUIREMENTS

- A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with NFPA 252.
- B. Mirrored Door: Comply with ANSI Z97.1 safety requirements.

1.04 SUBMITTALS

- A. Submit under provisions of Section 00 13 00 – Administrative Requirements.
- B. Product Data: Submit door manufacturer current product literature, including installation instruction.
- C. Samples: Provide finish samples for all products.
- D. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.
- E. Closeout Submittals: Refer to Section 00 17 00 Execution and Closeout Requirements Closeout Submittals.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store doors as recommended by manufacturer.

1.06 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Door Unit: 5 years.
 - 2. Door Frames: 1 year.
 - 3. Factory Prefinish: 1 year.
 - 4. P2 - PRODUCTS

1.07 MANUFACTURER

- A. Acceptable Manufacturer: JELD-WEN, Inc.; 2645 Silver Crescent Drive, Charlotte, NC 28273; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email: architectural_inquiries@jeld-wen.com; Web: <http://www.jeld-wen.com>.
- B. Substitutions: As approved by Architect.
- C. Requests for substitutions will be considered in accordance with provisions of Section 0 16 00 – Product Requirements.
- D. Basis of Design: Doors are based on JELD-WEN®'s Molded Interior Doors: Carrara

1.08 PASSAGE DOORS

- A. Door Style:
 - 1. Door Type: All panel.
 - 2. Door Shape: Squared Top.
 - 3. Surface Finish: Smooth
 - a. Panels and Sticking Profile: Two panels, with Cove and Bead sticking
 - b. Surface Finish: Smooth
- B. Core and Frame:
 - 1. Solid core with All-wood frame.
 - a. Thickness: 1-3/8 inch (35.1 mm)
- C. Hardware: None.
 - 1. Prep door for owner supplied hinge and lockset.
 - 2. Face Bore: 2-1/8 inch (54.1 mm) (Standard)
 - 3. Backset: 2-3/8 inch (60.5 mm) (Standard)
 - 4. Hardware Finish: Satin Nickel
- D. Finish: Preprimed
 - 1. Factory Prefinish Colors: As selected by Architect

1.09 PREHUNG DOORS

- A. Profile:
 - 1. System 01, Single Door.
 - 2. System 02, Double Door.
- B. Jambs:
 - 1. Jamb Width: 4-9/16 inch, 6-9/16 inch.
 - 2. Jamb Type: flat.
 - 3. Jamb Species: Stave Pine.
- C. Hinges: SAE 1010 Carbon Steel.
 - 1. Size: 3-1/2 inch (88.9 mm) by 3-1/2 inch (88.9 mm) with 5/8 inch (15.9 mm) radius corners (Standard for 1-3/8 inch (35.1 mm) thick doors)
 - a. Finish: As selected by Architect
 - b. Size: 3-1/2 inch (88.9 mm) by 3-1/2 inch (88.9 mm) with 5/8-inch (15.9 mm) Ball Bearing with radius corners (Available for 1-3/8 inch (35.1 mm) thick doors)
 - 1) Finish: As selected by Architect.
- D. Bolts/Catch: Finish: Chrome.

1.10 BIFOLD DOORS

- A. Door Style:
 - 1. Surface Finish: Smooth.
 - a. Panels and Sticking Profile: Two panels, with Cove and Bead sticking
 - b. Surface Finish: Textured.
- B. Core:
 - 1. Hollow core.

- a. Thickness: 1-3/8 inch.
- C. Hardware:
 - 1. Finish: satin nickel.
- Cl. Finish: Preprimed
 - 1. Factory Prefinish Colors: As selected by Architect.
 - 2. P3 - EXECUTION

1.11 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

1.12 EXAMINATION

- A. Inspect door prior to installation.
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

1.13 PREPARATION

- A. Prepare door for installation in accordance with manufacturer's recommendations.
- B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

1.14 PASSAGE DOOR INSTALLATION

- A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
- D. Shim top of jamb in center of opening and fasten with nail.
- E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
- F. Set nails.
- G. Install trim on both sides using nails every 12 to 16 inches.

1.15 BIFOLD DOOR INSTALLATION

- A. Attach door hardware to door.
- B. Attach jamb hardware.
 - 1. Fasten overhead track in center of finished opening by inserting screws through pre-drilled holes.
 - 2. Attach jamb brackets flush to finished floor in line with overhead track.
- C. Install door assemblies.
 - 1. Place pivot pin in hole at top corner bracket and place guide wheel in track.
 - 2. Lift door assembly and drop bottom pin into bottom bracket hole.
- D. Check positioning and operation. Adjust hardware if necessary.

END OF SECTION

SECTION 08 53 13
VINYL WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vinyl-framed, factory-glazed windows.
- B. Operating hardware.
- C. Insect screens.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.
- B. Section 07 90 05 - Joint Sealers: Sealing joints between frames and adjacent construction.
- C. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
- B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.
- C. AAMA 701/702 - Combined Voluntary Specifications for Pile Weatherstrip and Replaceable Fenestration Weatherseals; 2011.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- F. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- H. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
- I. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
- J. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2016.
- K. ASTM E1423 - Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems; 2014.
- L. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.
- M. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).
- N. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2017.
- O. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances and affected related work.
- D. Samples: Submit one corner, 8 by 8 inch (203 by 203 mm) in size, illustrating window frame section.
- E. Submit two samples of operating hardware.
- F. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- H. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- J. Manufacturer's Qualification Statement.
- K. Installer's Qualification Statement.
- L. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing of type specified and with at least three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).
- B. Maintain this minimum temperature during and after installation of sealants.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Vinyl Windows:
 - 1. Alside, Inc; www.alside.com/#sle.
 - 2. Pella Corporation; Encompass by Pella Vinyl Windows: www.pellacommercial.com/#sle.
 - 3. Prime Window Systems, LLC; Series 9000: www.primewindowsys.com/#sle.
 - 4. Silver Line by Andersen: www.silverlinewindows.com/#sle.
 - a. New Construction:
 - 1) Single Hung: 2900 Series.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DESCRIPTION

- A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
 - 1. Configuration: As indicated on drawings.
 - a. Product Type: FW - Fixed window and H - Hung window, vertically sliding in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 2. Color: White.
 - 3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
 - 4. Operable Units: Double weatherstripped.
 - 5. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
 - 6. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
 - 7. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.
 - 8. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
 - 9. Insect Screens: Tight fitting for operating sash location.

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - 1. Performance Class (PC): R.
 - 2. Performance Grade (PG): 15, with minimum design pressure (DP) of 15.04 psf (720 Pa).
- B. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency and passed in accordance with ASTM E1996 for Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
- C. Condensation Resistance Factor: CRF of 50, minimum, the lower value of the glass and frame window components and determined in accordance with AAMA 1503.
- D. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
- E. Forced Entry Resistance (FER): Tested to comply with ASTM F588 requirements having at least Grade 10 performance for each required window assembly.
- F. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 34, when tested in accordance with ASTM E90 and ASTM E1332.
- G. Meet or exceed Energy Star rating.

2.04 COMPONENTS

- A. Glazing: Insulated double pane, annealed glass, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions and acoustic rating indicated.
 - 1. Glass Stops: Snap-on PVC glazing bead with color to match sash and frame.
 - 2. Glazing Tape: Closed cell foam type with double sided adhesive.
 - 3. Setting Blocks: Manufacturer's standard.
 - 4. Secondary Glass Panel: Tempered glass as required in drawings, 1/8 inch (3.2 mm) thick.
- B. Frame Depth: 2-11/16 inch (68.3 mm).
- C. Divided Lite Grid: Installed between panes of insulating glass and on exterior face of glass; 5/8 inch (15.9 mm) wide flat metal bars, color to match frame and sash.
 - 1. Pattern: Custom design, refer to drawings for required muntin patterns on each home.
- D. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
 - 1. Hardware: Manufacturer's standard; quantity as required per screen.
 - 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh.
 - 3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.
- E. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to maintain weather seal in accordance with AAMA 701/702.
- F. Fasteners: Stainless steel.
- G. Accessories: Provide related flashings, anchorage and attachment devices as necessary for full assembly.
- H. Glazing Sealant: As specified in Section 08 80 00.
- I. Exterior Window Sills: Refer to drawings.
- J. Sealants for Setting Window Sill Pan Flashing: Provide butyl tape, non-hardening butyl, polyurethane, or silicone sealant; in compliance with ASTM E2112 installation practices.

2.05 HARDWARE

- A. Horizontal Sliding Sash: Rigid PVC interfacing tracks with dual brass wheel and stainless steel axle assembly housing, provide two sets for each operating sash and opening stops in head and sill track as required.
- B. Vertical Sliding Sash: Metal and nylon spiral friction slide cylinder, provide two for each sash and jamb.
- C. Sash lock: Lever handle and keeper with cam lock, provide at least one for each operating sash.
- D. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive this work.

3.02 INSTALLATION

- A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.
- B. Install windows in accordance with ASTM E2112.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.
- D. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.

- E. Set sill members and sill flashing in continuous bead of sealant.
- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Install operating hardware.
- H. Install glass and infill panels in accordance with Section 08 80 00, to glazing method required to achieve performance criteria.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 0.5 inches per 100 ft (12 mm/30 m), whichever is less.

3.04 FIELD QUALITY CONTROL

- A. Provide services of vinyl window manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 40 00 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- C. Provide field testing of installed vinyl windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
 - 1. Perform tests on three individual windows in designated locations as indicated on drawings.
 - 2. Conduct tests on individual windows prior to 5 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
 - 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf (300 Pa).
 - a. Maximum allowable rate of air leakage is 0.10 cfm/sq ft (0.5 L/s sq m).
- D. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

- A. Refer to Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove protective material from pre-finished surfaces.
- C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes furnishing and installation of door hardware for doors specified in "Hardware Sets" and required by actual conditions. Including screws, bolts, expansion shields, and other devices for proper application of hardware. Where existing doors and frames are being reused, provide items that fit into existing door or frame preparations.
- B. Where items of hardware are not specified and are required for intended service, such omission, error or other discrepancy to be submitted to Architect fourteen calendar days prior to bid date for clarification by addendum.
- C. Products supplied but not installed under this Section:
 - 1. Final replacement of cylinder cores to be installed by Owner.
- D. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- E. Related Divisions:
 - 1. Division 08 Openings

1.02 REFERENCES

- A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
 - 1. ANSI/BHMA A156.1 Butts & Hinges (2006)
 - 2. ANSI/BHMA A156.2 Bored & Preassembled Locks & Latches (2011)
 - 3. ANSI/BHMA A156.5 Cylinders and Input Devices for Locks (2014)
 - 4. ANSI/BHMA A156.7 Template Hinge Dimensions (2009)
 - 5. ANSI/BHMA A156.12 Interconnected Locks & Latches (2005)
 - 6. ANSI/BHMA A156.16 Auxiliary Hardware (2008)
 - 7. ANSI/BHMA A156.18 Materials & Finishes (2006)
 - 8. ANSI/BHMA A156.21 Thresholds (2009)
 - 9. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
 - 10. ANSI/BHMA A156.28 Keying Systems (2007)
 - 11. ANSI/BHMA A156.36 Auxiliary Locks (2010)
 - 12. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames (2014)
 - 13. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames (2006)
- B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:
 - 1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities
 - 2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- C. Door and Hardware Institute (DHI):
 - 1. DHI Publication - Keying Systems and Nomenclature (1989).
 - 2. DHI Publication - Abbreviations and Symbols.
 - 3. DHI Publication - Installation Guide for Doors and Hardware.
 - 4. DHI Publication - Sequence and Format of Hardware Schedule (1996).
- D. National Fire Protection Agency (NFPA):
 - 1. NFPA 101 Life Safety Code
- E. Building Codes:
 - 1. IBC International Building Code 2012
 - 2. Local Building Code.

1.03 SUBMITTALS

- A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements.

- B. Shop Drawings:
 - 1. Organize hardware schedule organized in vertical format illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
 - 2. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
 - 3. Architectural Hardware Consultant (AHC), as certified by DHI, who shall affix seal attesting to completeness and correctness, shall review hardware schedule prior to submittal.
- C. Submit manufacturer's catalog sheet on design, grade and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide index, and cover sheet.
- D. Coordination: Distribute door hardware templates to related divisions within fourteen days of receiving approved door hardware submittals.
- E. Closeout Submittals: Submit to Owner in a three-ring binder or CD if requested.
 - 1. Warranties.
 - 2. Maintenance and operating manual.
 - 3. Maintenance service agreement.
 - 4. Record documents.
 - 5. Copy of approved hardware schedule.
 - 6. Copy of approved keying schedule with bitting list.
 - 7. Door hardware supplier name, phone number and fax number.

1.04 QUALITY ASSURANCE

- A. Hardware supplier shall employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who shall be available at reasonable times during course of work for Project hardware consultation.
- B. Door hardware conforming to ICC/ANSI A117.1: Handles, pulls, latches, locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
- C. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.
- D. Substitution request: Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design, function, and quality. Approval of request is at the discretion of the owner, architect, and their designated consultants.
- E. Pre-installation Meeting: Comply with requirements in Division 1 Section "Project Meetings".
 - 1. Convene meeting seven days before installation. Participants required to attend:
 - a. Contractor, installer, material supplier, manufacturer representatives
 - 2. Include in-conference decisions regarding proper installation methods and procedures for receiving and handling hardware.
 - 3. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
- F. Within fourteen days of receipt of approved door hardware submittals contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owner's instructions.
- G. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.
- H. Hardware listed in 3.07 - Hardware Schedule is intended to establish type and grade.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed.
- B. Furnish hardware with each unit marked and numbered in accordance with approved finish hardware schedule. Include door and item number for each type of hardware.
- C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.
- D. Deliver permanent keys, cores and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to Owner shall be established at "Keying Conference."
- E. Waste Management and Disposal: Separate waste materials for reuse or recycling in accordance with Division 1.

1.06 WARRANTY

- A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrent with other warranties made by Contractor under requirements of the Contract documents.
- B. Special Warranty: Warranties specified in this article shall not deprive Owner of other rights.
 - 1. Five years for mortise, auxiliary and bored locks.
 - 2. One year for remaining finish hardware.
- C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse and failure to exercise normal maintenance.
- D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS LISTED IN THE HARDWARE SPECIFICATION ARE AS FOLLOWS:

- A. For Residences:
 - 1. Hinges, Thresholds, Weather Strip & Silencers: As specified. If door is Pre-Hung: by others
 - 2. Entry Handle Sets, Levers & Deadlocks: Schlage
 - 3. Barn Door Hardware: Hager Company
 - 4. Bi-Fold Door Hardware: Johnson Hardware
 - 5. Wall Stops: Hager Company
 - 6. Hinge Pin Stops: Don-Jo
- B. For Community Building
 - 1. Butt Hinges and Continuous Hinges: Hager Company
 - 2. Exit Devices: Von Duprin
 - 3. Locks and Cylinders: Schlage
 - 4. Pocket Door lock and pulls: Hager
 - 5. Closers: LCN
 - 6. Overhead Stops: Glynn Johnson
 - 7. Push/Pulls, Kick Plates and Door Stops: Hager Company
 - 8. Seals, Thresholds and Gaskets: National Guard Products
 - 9. Silencers: Ives
 - 10. Door stops: floor and wall - Assa Abloy Rockwood Architectural Line

2.02 HINGES

- A. Hinges and self-closing hinges of one manufacturer as listed for continuity of design and consideration of warranty.

- B. Standards: Products to be certified and listed by the following:
 - 1. Butts and Hinges: ANSI/BHMA A156.1.
 - 2. Template Hinge Dimensions: ANSI/BHMA A156.7.
- C. Butt Hinges:
 - 1. Hinge weight and size unless otherwise indicated in hardware sets:
 - a. Doors up to 36" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .134" and a minimum of 4-1/2" in height.
 - b. Width of hinge is to be minimum required to clear surrounding trim.
 - 2. Base material unless otherwise indicated in hardware sets:
 - a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
 - b. Interior Doors: Steel material.
 - 3. Quantity of hinges per door unless otherwise stated in hardware sets:
 - a. Doors up to 60" in height provide 2 hinges.
 - b. Doors 60" up to 90" in height provide 3 hinges.
 - 4. Hinge design and options unless otherwise indicated in hardware sets:
 - a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
 - b. Out-swinging exterior and out-swinging access controlled doors shall have
 - c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
 - d. When shims are necessary to correct frame or door irregularities, provide metal shims only.
 - 5. Acceptable Manufacturers:
 - a. Standard Weight
 - b. Hager: BB1279/BB1191
 - c. Bommer: BB5000/BB5002
 - d. McKinney: TA2714/TA2314

2.03 LOCKS AND LATCHES - EXTERIOR DOORS

- A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Product to be certified and listed by following:
 - 1. ANSI/BHMA A156.2 Series 4000 Certified to Grade 1.
- C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.
- D. Material and Design:
 - 1. Lock and Latch chassis to be zinc dichromate for corrosion resistance.
 - 2. Keyed functions to be of a freewheeling design to help resist against vandalism.
 - 3. Non-handed, field reversible.
 - 4. Thru-bolt mounting with no exposed screws.
 - 5. Levers, zinc cast and plated to match finish designation in hardware sets.
 - 6. Roses, wrought Brass or Stainless Steel material.
- E. Latch and Strike:
 - 1. Stainless Steel latch bolt with minimum of 1/2" throw and deadlocking for keyed and exterior functions. Standard backset to be 2-3/4" and adjustable faceplate to accommodate a square edge door or a standard 1/8" beveled edge door.
 - 2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.

2.04 CYLINDERS AND KEYING

- A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.

- B. Coordinate keying with Owner prior to construction. All locks shall be master keyed into new master key Falcon small format interchangeable core (SFIC) system. Supply 3 operating keys per lock, 3 master keys and 3 Control Keys.

2.05 PROTECTIVE TRIM

- A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Size of protection plate: Single doors, size two inches less door width (LDW) on push side of door, and one inch less on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and ½ inch on pull side of door.
 - 1. Kick Plates 8" high or sized to door bottom rail height.
- C. Standards: Manufacturer shall meet requirements for:
 - 1. Architectural Door Trim: ANSI/BHMA A156.6.
- D. Material and Design:
 - 1. 0.050" gage stainless steel.
 - 2. Corners square, polishing lines or dominant direction of surface pattern shall run across door width of plate.
 - 3. Bevel top, bottom and sides uniformly leaving no sharp edges.
 - 4. Countersink holes for screws. Screw holes shall be spaced equidistant eight inches CTC, along a centerline not over 1/2" in from edge around plate. End screws maximum of 0.53" from corners.
- E. Acceptable Manufacturers:
 - 1. Hager: 194S
 - 2. Trimco:
 - 3. Burns:

2.06 STOPS AND HOLDERS

- A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Wall Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Provide wall stops when possible. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.
- C. Provide door stops where indicated in hardware sets. Provide wall stop type 236W. Provide Don-Jo hinge pin stops type 1507 or 1512 as required where wall stops cannot be used. Supply two stops for top and middle hinge locations each door where required.

2.07 THRESHOLDS

- A. Thresholds of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Set thresholds for exterior and acoustical openings in full bed of sealant with lead expansion shields and stainless steel machine screws complying with requirements specified in Division 7 Section "Joint Sealants". Notched in field to fit frame by hardware installer. Refer to Drawings for special details.
- C. Standards: Manufacturer to be certified by the following:
 - 1. Thresholds: ANSI/BHMA A156.21.
 - 2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- D. Acceptable Manufacturers:
 - 1. Hager: 402S/417S
 - 2. National Guard Products: 425
 - 3. Reese:

2.08 DOOR GASKETING AND WEATHERSTRIP

- A. Door gasketing and weatherstrip of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide non-corrosive fasteners for exterior applications.
 - 1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Door bottoms: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
 - 3. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
- C. Standards: Manufacturer shall meet requirements for:
 - 1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22.
 - 2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing.
- D. Acceptable Manufacturers:
 - 1. Perimeter Gasketing:
 - a. Adhesive Applied Stop Applied
 - b. Hager: 726
 - c. National Guard Products: 5050
 - d. Reese:
 - 2. Automatic Door Bottoms:
 - a. Hager: 742S
 - b. National Guard Products:
 - c. Reese:

2.09 DOOR VIEWER

- A. Door viewer of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Manufacturer shall conform to:
 - 1. Auxiliary Hardware: ANSI/BHMA A156.16 for L033221.
- C. Design:
 - 1. Adjustable for use on doors 1-3/8" to 2-1/8" thick doors, 9/16" hole required.
 - 2. One way 200 degree view.
- D. Acceptable Manufacturers:
 - 1. Hager: 1756
 - 2. Rockwood:
 - 3. Trimco:

2.10 SILENCERS

- A. Where smoke, light, or weather seal are not required, provide three silencers per single door frame, two per double door frame.
- B. Standards: Manufacturer shall meet requirements for:
 - 1. Auxiliary Hardware: ANSI/BHMA A156.16
- C. Acceptable Manufacturers:
 - 1. Hollow Metal Frame
 - 2. Hager: 307D
 - 3. Rockwood:
 - 4. Trimco:

2.11 KEY CABINET

- A. Provide key cabinet for Owner to mount as directed.
- B. Key control system:
 - 1. Include two sets of key tags, hooks, labels, and envelopes.

2. Contain system in metal cabinet with baked enamel finish.
 3. Capacity shall be able to hold actual quantities of keys, plus 50 percent.
 4. Provide tools, instruction sheets and accessories required to complete installation.
- C. Acceptable Manufacturers:
1. Lund Equipment
 2. Telkee Incorporated
 3. Key Control

2.12 FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples.
- B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.
- C. Finish of hinges, locksets and miscellaneous hardware shall be US15 (619) satin nickel finish. Barn Door hardware shall be US32D (630) finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install hardware per manufacturer's instructions and in compliance with:
 1. ICC/ANSI A117.1
 2. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
 3. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames
 4. DHI Publication - Installation Guide for Doors and Hardware
 5. Local building code.
 6. Approved shop drawings.
 7. Approved finish hardware schedule.
- B. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

3.03 FIELD QUALITY CONTROL

- A. Material supplier to schedule final walk through to inspect hardware installation ten (10) business days before final acceptance of Owner. Material supplier shall provide a written report detailing discrepancies of each opening to General Contractor within seven (7) calendar days of walk through.

3.04 ADJUSTMENT, CLEANING AND DEMONSTRATING

- A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.
- B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finish hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.

- C. Demonstration: Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finish hardware to be turned over and explained usage at this meeting.

3.05 PROTECTION

- A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts project as complete.

3.06 HARDWARE SET SCHEDULE

- A. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.
- B. Hardware schedule does not reflect handing, backset, method of fastening, and like characteristics of door hardware and door operation.
- C. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE FOR RESIDENCES

- A. Hardware Set 1 - each to have:
 - 1. Pre-Hung Doors complete with hardware except the following:
 - 2. Entry Set Passage FE285 CEN BRW GSN 619
 - 3. Deadlock B560BD 619
 - 4. Interchangeable Core Falcon SFIC as required 626
 - 5. Wall Stop 236W 619
 - 6. Door Viewer 1756 @ flush doors only 626
- B. Hardware Set 2 - each to have:
 - 1. Pre-Hung Doors complete with hardware except the following:
 - 2. Lever Passage F10 BRW GSN 619
 - 3. Deadlock B560BD 619
 - 4. Interchangeable Core Falcon SFIC as required 626
- C. Hardware Set 3 - each to have:
 - 1. Pre-Hung Doors complete with hardware except the following:
 - 2. Lever Privacy F40 BRW GSN 619
 - 3. Door Stop236W 619
- D. Hardware Set 4 - each to have:
 - 1. Pre-Hung Doors complete with hardware except the following:
 - 2. Lever Passage F10 BRW GSN 619
- E. Hardware Set 5 - each to have:
 - 1. Bi-Fold Hardware Set 100FD Four Panel x 1125 Ball Bearing Hangers
- F. Hardware Set 6 - each to have:
 - 1. Barn Door Hardware Set 9432-96 630
 - 2. Lever Privacy 94582D 630
- G. Hardware Set 7 - each to have:
 - 1. Bi-Fold Hardware Set 100FD Two Panel x 1125 Ball Bearing Hangers
- H. Hardware Set 8 - each to have:
 - 1. Barn Door Hardware Set 9432-78 630
 - 2. Lever Privacy 94582D 630
- I. Hardware Set 9 - each to have:
 - 1. Access Panels and Attic Access Doors complete with hardware by others.

3.08 HARDWARE SCHEDULE FOR COMMUNITY BUILDING

- A. Set 1 - Each to Have:
 - 1. Butt Hinges BB1191- 5" x 4.5"
 - 2. Exit Device 99L x 17 Lever
 - 3. Cylinder Falcon SFIC as required
 - 4. Door Closer 4040XP S-H-Cush
 - 5. Threshold425
 - 6. Set Weatherstrip 127NA – Head & Jambs
 - 7. Door Sweep 200NA
 - 8. Drip Cap 16A x Full frame width
- B. Set 2 - Each to Have:
 - 1. Butt Hinges BB1191- 4.5" x 4.5"
 - 2. Mullion 4954
 - 3. Exit Device 99DT
 - 4. Exit Device 99NL
 - 5. Cylinder Falcon SFIC as required
 - 6. Door Closers 4040XP S-H-Cush
 - 7. Threshold425
 - 8. Set Weatherstrip 127NA – Head & Jambs
 - 9. Door Sweeps 200NA
 - 10. Drip Cap 16A x Full frame width
- C. Set 3 - Each to Have:
 - 1. Continuous Hinges 780-112-HD
 - 2. Flush Bolt Set 282D
 - 3. Lever Storeroom L9480B x 17 Lever x Falcon SFIC as required
 - 4. Overhead Stop/holders GJ70H-Series
 - 5. Kick Plates 190S 8" x 1" LDW
 - 6. Set Weatherstrip 127NA – Head & Jambs
 - 7. Threshold425
 - 8. Set Astragals 115NA – Meeting edge
 - 9. Door Sweeps 200NA
 - 10. Drip Cap 16A x Full frame width
- D. Set 4 - Each to Have:
 - 1. Butt Hinges BB1279 4.5" x 4.5"
 - 2. Lever Office ND50BD x SPA x Falcon SFIC as required
 - 3. Door Stop RM 867
 - 4. Silencers SR64
- E. Set 5 - Each to Have:
 - 1. Pocket Door Hdwe Set100PD- Series x 1125BB Hangers. (105A & 105B)
 - 2. Pocket Door Lock 3800 x Falcon SFIC as required (Omit @ 105B)
 - 3. Edge Pulls 9884
- F. Set 6 - Each to Have:
 - 1. Butt Hinges BB1279 4.5" x 4.5"
 - 2. Lever Office ND50BD x SPA x Falcon SFIC as required
 - 3. Kick Plate190S 16" x 2" LDW
 - 4. Overhead Stop/Holder GJ70H-Series
 - 5. Silencers SR64
- G. Set 7 - Each to Have:
 - 1. Butt Hinges BB1279 4.5" x 4.5"
 - 2. Lever Privacy ND40S x SPA
 - 3. Door Closer 1461

4. Kick Plate 190S 8" x 2" LDW
5. Door Stop RM8667
6. Silencers SR64

H. Set 8 - Each to Have:

1. Butt Hinges BB1279 4.5" x 4.5"
2. Push Plate 30S - 8" x 16"
3. Pull Plate H33G - 4" x 16" (2-1/2" Clearance)
4. Door Closer 1461
5. Kick Plate 190S 8" x 2" LDW
6. Door Stop RM867
7. Silencers SR64

I. Set 9 - Each to Have:

1. Butt Hinges BB1279 4.5" x 4.5"
2. Flush Bolt Set 282D
3. Dust Proof Strike 280X
4. Lever Classroom ND53BD x SPA x Falcon SFIC as required
5. Overhead Stops GJ70S-Series
6. Silencers SR64

J.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers.
- B. Section 07 90 05 - Joint Sealers: Sealant and back-up material.
- C. Section 08 11 50: Steel Doors: Glazed lites in doors and borrowed lites.
- D. Section 08 53 13 - Vinyl Windows: Glazing furnished by window manufacturer.
- E. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- K. GANA (GM) - GANA Glazing Manual; 2009.
- L. GANA (SM) - GANA Sealant Manual; 2008.
- M. ICC (IBC) - International Building Code; 2015.
- N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2004).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Certificates: Certify that products meet or exceed specified requirements.

- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.

1.07 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glass, double glazed - Solar Ban 60.
 - 1. Application: All exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Annealed float glass and fully tempered glass per the opening schedule/drawings; 1/4 inch (6 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Self-cleaning type, on #1 surface.
 - c. Coating: Low-E (passive type), on #2 surface.
 - 3. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
 - a. Tint: Clear.
 - 4. Total Thickness: 1 inch (____ mm).
 - 5. Total Solar Heat Gain Coefficient: .46 max percent, nominal.
 - 6. Glazing Method: Gasket glazing.

2.02 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing, with Low-E coating.
 - 1. Application: All exterior glazing unless otherwise indicated.
 - 2. Substitutions: Refer to Section 01 60 00 - Product Requirements.
 - 3. Between-lite space filled with argon.
 - 4. Basis of Design: PPG Industries, Inc: www.ppgideascape.com.
 - 5. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
 - a. Low-E Coating: PPG Solarban 60 on #2 surface.
 - 6. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick.
 - a. Tint: Clear.
 - 7. Total Thickness: 1 inch (25 mm).
 - 8. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another acceptable manufacturer.
 - 9. Substitution Procedures: See Section 01 60 00 - Product Requirements.
 - a. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 GLAZING UNITS

- A. Type S-3 - Single Safety Glazing: Non-fire-rated.
 - 1. Application: Provide this type of glazing in the following locations:

- a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on the drawings.
 - e. Provide in windows less than 24" from a door as required by code..
2. Type: Fully tempered float glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6 mm).

2.04 EXTERIOR GLAZING ASSEMBLIES

- A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
 1. Design Pressure: Calculated in accordance with applicable codes.
 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 4. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
 5. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 6. Glass thicknesses listed are minimum.
- B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
 2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.05 GLASS MATERIALS

- A. Fabricators:
 1. Trulite Glass and Aluminum Solutions: www.trulite.com.
 2. Viracon, Inc: www.viracon.com.
 3. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Float Glass Manufacturers:
 1. Cardinal Glass Industries: www.cardinalcorp.com.
 2. Guardian Industries Corp: www.sunguardglass.com.
 3. Pilkington North America Inc: www.pilkington.com/na.
 4. PPG Industries, Inc: www.ppgideascape.com.
 5. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- C. Float Glass: Provide float glass based glazing unless noted otherwise.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
 3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
 4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

2.06 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
 1. Any of the manufacturers specified for float glass.
 2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
 3. Cardinal Glass Industries: www.cardinalcorp.com.

4. Viracon, Apogee Enterprises, Inc: www.viracon.com.
 5. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Sealed Insulating Glass Units: Types as indicated.
1. Application: Exterior, except as otherwise indicated.
 2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 3. Edge Spacers: Aluminum, bent and soldered corners.
 4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 5. Purge interpane space with dry hermetic air.

2.07 GLAZING COMPOUNDS

- A. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
 2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 3. Pecora Corporation: www.pecora.com.
 4. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 5. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

2.08 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
1. Width: As required for application.
 2. Thickness: As required for application.
 3. Spacer Rod Diameter: As required for application.
 4. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. Tremco Global Sealants: www.tremcosealants.com.
 - c. Substitutions: Refer to Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

3.03 GLAZING METHODS

- A. Aluminum Storefront System: comply with requirements of system provided.

- B. Interior Hollow Metal Frames:
 - 1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
 - 2. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
 - 3. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
 - 4. Place glazing tape on free perimeter of glazing in same manner described above.
 - 5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
 - 6. Knife trim protruding tape.

3.04 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 08 84 00
PLASTIC GLAZING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Enhanced UV-resistant polycarbonate plastic glazing.

1.02 REFERENCES

- A. ANSI Z 97.1 - American National Standard for Glazing Materials Used in Buildings -- Safety Performance Specifications and Methods of Test.
- B. ASTM D 256 - Standard Test Method for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
- C. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
- D. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM D 1929 - Standard Test Method for Ignition Properties of Plastics.
- F. ASTM D 635 – Standard Test Method for Rate of Building and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- G. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- H. CAN/ULC 102.2 – Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract and Division 1 specification section 01 33 00 “Submittal Procedures”.
- B. Product Data: Submit manufacturer’s product data; including product description, fabrication information, and compliance with specified performance requirements.
- C. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1. Test reports required are:
 - a. Rate of Burning (ASTM D 635)
 - b. Self-Ignition Temperature (ASTM D 1929)
 - c. Flame Spread and Smoke Developed (ASTM E 84)
 - d. Impact Strength (ASTM D 3763)
 - e. Safety Glazing and Impact Strength (ANSI Z97.1-2004)
 - 2. Samples for Initial Selection:
 - a. Submit minimum 2-inch by 2-inch samples. Indicate full color.
 - 3. Samples for Verification:
 - a. Submit minimum 4-inch by 4-inch sample for each type and color of solid plastic fabrication.
 - 4. Mockups:
 - a. Build mockup to verify selections made under sample Submittals and to demonstrate aesthetic effects and connections.
 - b. Approved mockups may become part of the completed work if undistributed at time of Substantial Completion.
 - 5. Maintenance Data: Submit manufacturer’s care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.
 - a. QUALITY ASSURANCE
 - 6. Manufacturer’s Qualifications

- a. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least five (5) consecutive years and which can show evidence of those materials being satisfactory used on at least six (6) projects of similar size, scope and location.
 - b. Manufacturer must have documented training and qualification program for fabrication and installation of plastic fabrications.
 - 1) DELIVERY, STORAGE, AND HANDLING
7. Deliver Plastic Fabrications, systems and specified items in manufacturer's standard protective masking.
 8. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.
 9. Handle materials to prevent damage to finished surfaces.
 10. Before installing Plastic Fabrications, permit them to reach room temperature.
 11. Do not deliver Plastic Fabrications, systems, components and accessories to Project site until areas are ready for installation.
- D. WARRANTY
1. Manufacturer's Special Warranty on Plastic Fabrications: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.
 2. Warranty Period: 5 years from ship date.
 3. The warranty shall not deprive the owner of other rights or remedies the Owner may have under provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: 3form, Inc., Salt Lake City, Utah, USA / telephone 801-649-2500

2.02 MATERIALS

- A. 3form Translucent Resin Panel System - Koda XT produced from polycarbonate sheet
1. Engineered polycarbonate resin
 2. Sheet Size: As designated on drawings, maximum 4'x10'
 3. Thickness: 1/2"
 4. Provide Half Lap Joints as indicated on drawings for radius panel joinery.
 5. Basis of Design Product: The design of Plastic Fabrications is based on Koda XT as provided by 3form, Inc. Equal products from other manufacturers must be approved by the Architect and Designer prior to bidding in accordance with the Instructions to Bidders and Section 10 60 00 "Product Requirements".
 6. Sheet Minimum Performance Attributes:
 - a. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
 - b. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-Ignition Temperature greater than 650°F.
 - c. Flame Spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class B (Flame spread less than 75 and smoke less than 450) at thickness of 1/2".
 - d. Impact Strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).
 - e. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004.
- B. Stand-Off Mounting Hardware
1. 3-15-0030-K - 1.5" diameter cap with 1.25" long M10 threads and Panel Protection
 2. 3-15-0031-K 1.5" x 2' barrel, M10 threads and Stainless Washer
 3. 3-15-0109 Threadlocking Tape

4. 3-15-0108 EPTFE Washer
5. 3-15-0107 Shoulder Washer
6. 3-15-0105 Fender Washer
7. 3-15-0106 Adjustable pin spanner wrench for holes 3/4" to 2" circle diameter, 1/8" pin

2.03 FABRICATION

- A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
- B. Comply with manufacturer's written recommendations for fabrication.
- C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
 1. Sawing: Select equipment and blades suitable for type of cut required.
 2. Drilling: Drills specifically designed for use with plastic products.
 3. Milling: Climb cut where possible.
 4. Routing
 5. Tapping
- D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
 1. Cold Bending
 2. Hot Bending
- E. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

2.04 ACCESSORIES

- A. Gaskets shall be as per manufacturer's standards to meet performance criteria.
- B. Fasteners shall be per manufacturer's standards to meet performance requirements.

2.05 MISCELLANEOUS MATERIALS

- A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaner: Type recommended by manufacturer.
- C. Fasteners: Use screws designed specifically for plastics.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications.
- B. Manufacturer's shop to fabricate items to the greatest degree possible.
- C. Utilize all fasteners recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.
- D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- E. We recommend that installation is completed by a 3form Certified Installer. Contact 3form for more information or to get a quote.

3.03 CLEANING AND PROTECTION

- A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 09 21 16
GYPSON BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum sheathing.
- D. Cementitious backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.
- C. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- D. Section 07 90 05 - Joint Sealers: Sealing acoustical gaps in construction other than gypsum board.

1.03 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- C. ANSI A108.11-SystemDeleted - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).
- D. ANSI A118.9-SystemDeleted - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- F. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
- G. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009).
- H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- L. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- M. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.
- N. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2007a (Reapproved 2011).

- O. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets; 2014.
- P. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.
- Q. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- R. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.
- S. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.
- T. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- U. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- V. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- W. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- X. GA-216 - Application and Finishing of Gypsum Board; 2013.
- Y. ICC (IBC) - International Building Code; 2015.
- Z. UL (FRD) - Fire Resistance Directory; Current Edition.
- AA. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
 1. Fire Rated Partitions: UL listed assembly No. U 305; one hour rating.
 2. Head of Fire Rated Partitions: UL listed assembly No. per drawings.
 3. Fire Rated Ceilings and Soffits: One (1) hour fire rating.
 4. Fire Rated Area Separation Walls: See drawings; for hour rating.
 5. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 1. Armstrong Ceilings: www.armstrongceilings.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Continental Building Products: www.continental-bp.com/#sle.
 - 4. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 5. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 6. USG Corporation: www.usg.com/#sle.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - 4. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 5. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 - 6. Paper-Faced Products:
 - a. American Gypsum Company; LightRoc Gypsum Wallboard.
 - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
 - c. Georgia-Pacific Gypsum; ToughRock.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X.
 - e. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board.
 - f. National Gypsum Company; Gold Bond 3/4" Ultra-Shield FS Gypsum Board.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
 - 7. Mold Resistant Paper Faced Products:
 - a. American Gypsum Company; M-Bloc.
 - b. American Gypsum Company; M-Bloc Type X.
 - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - e. National Gypsum Company; Gold Bond XP Gypsum Board.
 - f. National Gypsum Company; Gold Bond 3/4" Ultra-Shield FS XP Gypsum Board.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Backing Board For Wet Areas: One of the following products:
 - 1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
 - 2. Application: Horizontal surfaces behind tile in wet areas including countertops.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 4. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch (12.7 mm).
 - b. Products:
 - 1) Custom Building Products: www.custombuildingproducts.com/#sle.

- 2) National Gypsum Company; PermaBase Cement Board:
www.nationalgypsum.com/#sle.
- 3) USG Corporation: www.usg.com/#sle.
- 4) Substitutions: See Section 01 60 00 - Product Requirements.
- 5. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
 - a. Thickness: 1/2 inch (12.7 mm).
 - b. Products:
 - 1) James Hardie Building Products, Inc: www.jameshardie.com/#sle.
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings, unless otherwise indicated.
 - 2. Thickness: 1/2 inch (13 mm).
 - 3. Edges: Tapered.
 - 4. Products:
 - a. CertainTeed Corporation; Interior Ceiling Drywall.
 - b. Continental Building Products; Sagcheck.
 - c. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, beveled long edges, ends square cut.
 - 1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Paper-Faced Products:
 - a. American Gypsum Company; M-Bloc Shaft Liner.
 - b. American Gypsum Company; Shaft Liner.
 - c. CertainTeed Corporation; M2Tech Type X Shaftliner.
 - d. Georgia-Pacific Gypsum; ToughRock Shaftliner.
 - e. National Gypsum Company; Gold Bond Fire-Shield Shaftliner XP.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
 - 4. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Shaft Liner.
 - b. CertainTeed Corporation; GlasRoc Shaftliner Type X.
 - c. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).
 - d. National Gypsum Company; Gold Bond Brand eXP Shaftliner.
 - e. National Gypsum Company; Gold Bond Fire-Shield Shaftliner XP.
 - 5. Products:
 - a. American Gypsum Company; M-Bloc Shaft Liner.
 - b. American Gypsum Company; Shaft Liner.
 - c. Georgia-Pacific Gypsum; ToughRock Shaftliner.

2.04 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3.5 inch (_____ mm).
- B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
 - 1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Tape Thickness: 1/4 inch (6 mm).
- C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Expansion Joints:
 - a. Type: V-shaped PVC with tear away fins.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 2. Ready-mixed vinyl-based joint compound.
 - 3. Chemical hardening type compound.
- F. Nails for Attachment to Wood Members: ASTM C514.
- G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
 - 1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches (600 mm) on center.
 - 2. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.
 - 1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
 - 2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

- A. Studs: Space studs as indicated.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling framing in accordance with details.
 - 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- C. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall mounted cabinets.
 - 3. Toilet accessories.
 - 4. Wall mounted door hardware.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.05 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Cementitious Backing Board: Install over wood framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
 - 2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.07 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- D. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- E. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
 - 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
 - 3. Taping, filling and sanding is not required at base layer of double layer applications.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for wall applications.
- B. Cementitious backer board as tile substrate.
- C. Coated glass mat backer board as tile substrate.
- D. Ceramic accessories.
- E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Sealing joints between tile work and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- L. ANSI A108.11-SystemDeleted - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).
- M. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

- O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.
- P. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Revised).
- Q. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
- R. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation; 2014.
- S. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.
- T. ASTM C373 - Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products, Ceramic Tiles, and Glass Tiles; 2014a.
- U. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.
- V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
- D. Installer Qualification: Engage an installer with a minimum of five commercial tile installations similar in material, design and scope to that indicated.
- E. Field Mockups: Install a fully finished mock-up for each type tile installation. Mock-up shall be a minimum of 6 feet (2M) square and will be reviewed for joint quality, color range, pattern and workmanship.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: As scheduled on drawings..
- B. Glazed Wall Tile: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 - 2. Size: 3 by 6 inch, 3" x 12", 4 1/4" x 8 9/16" nominal as scheduled on drawings.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: As scheduled on drawings.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: WT-1 and WT-2 running brick bond; WT-3 horizontal, column stack pattern as scheduled in drawings.
 - 7. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.
- C. Porcelain Floor Tile: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.1 percent as tested in accordance with ASTM C373.
 - 2. Size: 12 x 24 inch nominal as indicated on Finish Schedule.
 - 3. Thickness: 3/8 inch as scheduled.
 - 4. Edges: Square.
 - 5. Surface Finish: Unglazed.
 - 6. Color(s): As indicated on drawings.
 - 7. Pattern: half offset pattern with maximum 1/8" grout joints .

2.02 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.
- B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall tile.
 - b. Expansion and control joints, floor and wall.
 - c. UFAS compliant roll-in shower. Schluter SHOWERPROFILE_WS-WSK to be used at continuous edge of shower pan to bathroom floor.
 - 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.
 - b. Genesis APS International: www.genesis-aps.com/#sle.

2.03 SETTING MATERIALS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - 2. Custom Building Products; www.custombuildingproducts.com.
 - 3. LATICRETE International, Inc: www.laticrete.com.
 - 4. TEC: www.tecspecialty.com.

2.04 GROUTS

- A. Manufacturers:
 - 1. Custom Building Products: www.custombuildingproducts.com.
 - 2. LATICRETE International, Inc: www.laticrete.com.
 - 3. TEC; AccuColor, Premium Grout: www.tecspecialties.com.

- B. Standard Grout: ANSI A118.6 standard cement grout.
 - 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 - 2. Use sanded grout for joints 1/8 inch wide. Joints shall be 1/8 inch wide.
 - 3. Color(s): As selected by Architect from manufacturer's full line.

2.05 MAINTENANCE MATERIALS

- A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 - 1. Composition: Water-based colorless silicone.
 - 2. Color(s): As selected by Architect from manufacturer's full line.
 - 3. Products:
 - a. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer: www.merkrete.com/#sle.

2.06 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under resilient flooring; complying with ANSI A118.10.
 - 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 - 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Material: Synthetic rubber.
 - c. Thickness: 45 mils, minimum, dry film thickness.
 - d. Products:
 - 1) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
 - 2) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
 - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 4) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.
 - 5) Triple Flex Waterproofing Crack Isolation Membrane and Bonding Mortar System (324) as manufactured by TEC Specialties Products, Inc.
 - 6) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Patching and Leveling Products
 - 1. VersaPatch Latex modified floor patch and Leveler (327). as manufactured by TEC Specialty Products, Inc.
 - 2. Primer and Patch Additive (861), as manufactured by TEC Specialty Products, Inc.
- C. Expansion Joints, Control, Contraction, and Isolation Joints
 - 1. Refer to TCA Handbook, Installation Method EJ171 for recommendations on locating, treating and detailing various types of construction joints. NOTE: Architect must specify type of expansion joints and show location and details on drawings.
 - 2. Use sealant complying with ASTM C920 according to Type, Grade, Class and Uses required.
 - 3. Provide marble threshold trim strips, or other edging material where tile terminates at dissimilar finishes as shown or specified.
 - 4. Prefabricated expansion joints can also be used when suitable for installation.
- D. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
 - 1. Standard Type: Thickness 1/2 inch.
 - 2. Fire Resistant Type: Type X core, thickness 5/8 inch.
 - 3. Products:
 - a. Georgia Pacific DensShield Tile Backer.

b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- B. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep control and expansion joints free of mortar, grout, and adhesive.
- K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- L. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.
- B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.05 CLEANING

- A. Clean tile and grout surfaces.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.
- C. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- D. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.
- D. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- G. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.
- H. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- I. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.
- J. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 4 inch by 4 inch in size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 4 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Fire-Resistive Assemblies: Complete assembly listed and classified by 1 for the fire resistance indicated.
- C. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category as required for installation in Murfreesboro, TN and complying with the following:
 - 1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

- A. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 1 inches.
 - 4. NRC Range: .85 to .85, determined in accordance with ASTM E1264.
 - 5. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 7. Panel Edge: Square .
 - 8. Tile Edge: Square Tegular.
 - 9. Color: White.
 - 10. Suspension System Type Suprafine XL 9/16 Exposed T: Exposed grid. White.
 - 11. Products:
 - a. Armstrong World Industries, Inc; Calla 2824: www.armstrongceilings.com/#sle.
- B. Acoustical Panels, Type ACT-2: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 30 by 30 inches.
 - 3. Thickness: 1 inches.
 - 4. NRC Range: .85 to .85, determined in accordance with ASTM E1264.

5. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Panel Edge: Square.
8. Color: White.
9. Suspension System Type Suprafine XL 9/16 Exposed T: Exposed grid. White.
10. Products:
 - a. Armstrong World Industries, Inc; Calla 2856: www.armstrongceilings.com/#sle..

2.04 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid and cap. Heavy Duty system identified as ICC-ESR-1308.
 1. Application(s): Seismic RX Suspension System. BEREC or BEREC2 on all main beams
 2. Structural Classification: [Installed to ASTM E580 Seismic Design Category C.]
 3. Profile: Tee; 9/16 inch face width.
 4. Finish: Baked enamel.
 5. Color: White.
 6. Wall moulding; Min 7/8"
 7. Suspension system - all sides require 3/8" clearance. Suspension system must not be attached to wall moulding.
 8. Min 3/8" overlap of the suspension system to the wall moulding
 9. Ends of main beams and cross tees must be tied together to prevent their spreading
 10. Safety wires required on light fixtures.
 11. Products:
 - a. Suprafine XL 9/16" Exposed Tee.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, IBC Seismic Zone Categories C, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application for Seismic Zone C.
- E. Perimeter Moldings: Same metal and finish as grid.
 1. Size: As required for installation conditions and specified Seismic Design Category C.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM E580/E580M and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- F. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- J. Do not eccentrically load system or induce rotation of runners.
- K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
- G. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.
- H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.
- I. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories:
 - 1. Adhesives.
 - 2. Finishes and cleaners.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: SCS FloorScore certification documentation.
- B. Section 01 74 19 - Construction Waste Management and Disposal.
- C. Section 07 90 05 - Joint Sealers.

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- B. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2017.
- C. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2014.
- D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- E. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2018.
- F. ASTM F137 - Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus; 2008 (Reapproved 2013).
- G. ASTM F386 - Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces; 2017.
- H. ASTM F410 - Standard Test Method for Wear Layer Thickness of Resilient Floor Coverings by Optical Measurement; 2008 (Reapproved 2013).
- I. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.
- J. ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring; 2013.
- K. ASTM F963 - Standard Consumer Safety Specification for Toy Safety; 2011.
- L. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.
- M. ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change; 2003 (Reapproved 2013).
- N. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change; 2003 (Reapproved 2008).
- O. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.
- P. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- Q. ASTM F1914 - Standard Test Method for Short-Term Indentation and Residual Indentation of Resilient Floor Covering; 2007 (Reapproved 2011).

- R. ASTM F2055 - Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method; 2017.
- S. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- T. ASTM F2199 - Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat; 2009 (Reapproved 2014).
- U. ASTM F2421 - Standard Test Method for Measurement of Resilient Floor Plank by Dial Gage; 2005 (Reapproved 2011).
- V. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.
- W. NSF 332 - Sustainability Assessment for Resilient Floor Coverings; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings.
- C. Manufacturer's documentation for flooring and accessories:
 - 1. Technical Data.
 - 2. Installation and Maintenance.
 - 3. Warranty.
 - 4. Reclamation Program.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).
- B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F.

1.06 FIELD CONDITIONS

- A. Acclimate material at jobsite between 65 to 85 degrees F and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.
- B. Spread unopened cartons no more than 6 cartons high and at least 4 inches apart.
- C. Keep away from heating and cooling ducts and direct sunlight.
- D. If permanent HVAC is not operational, temporary means should be used to maintain the recommended temperature and relative humidity levels.
- E. Close areas to traffic during installation of flooring and accessories.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Aspecta® Five should only be installed by professional flooring contractors that have demonstrated successful installations of jobs in similar size and scope.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: :
 - 1. LVT-2 - EF Contract
 - 2. LVT-1 - Mohawk Group 160 South Industrial Blvd. Calhoun, GA 30701 Telephone: 800-554-6637 Fax: 877-244-8054 Website: www.mohawkgroup.com
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RESILIENT TILE FLOORING

- A. Luxury Vinyl Plank:
 - 1. Pattern: LVT-1 C0009 Secoya; LVT-2 Playbook EFCPB-002 Twig.
 - 2. Color: As scheduled in Finish Schedule on Drawings.
 - 3. Physical Properties:
 - a. Construction: Phthalate-free solid plank and tile made from 100 percent virgin vinyl.
 - b. Wear Layer Thickness: 20 mil (0.50 mm)
 - c. Overall Thickness: 5mm (.2")
 - d. ; Finish: Urethane coating with ceramic bead particles.
 - e. Size: LVT-1: 9" x 59"l (nominal); LVT-2 7" x 48"
 - 4. Manufacturing, Performance, and Safety Standards:
 - a. NSF 332 Certified: Platinum level.
 - b. ASTM F1700, Classification: Class III, Type B.
 - c. ASTM F386, Thickness: Passes requirements.
 - d. ASTM F410, Wear Layer Thickness: Passes requirements for commercial classification.
 - e. ASTM F2421/F2055, Size and Squareness: Passes requirements.
 - f. ASTM F1914, Residual Indentation: Surpasses requirements.
 - g. ASTM F137, Flexibility: Surpasses requirements.
 - h. ASTM F2199, Dimensional Stability: Surpasses requirements.
 - i. ASTM F925, Chemical Resistance: Surpasses requirements.
 - j. ASTM F1514, Resistance to Heat: Surpasses requirements.
 - k. ASTM F1515, Resistance to Light: Surpasses requirements.
 - l. ASTM E648/NFPA 253, Critical Radiant Flux: Class I.
 - m. ASTM E662, Smoke Density (Flaming and Non-Flaming): Passes requirements.
 - n. ASTM F963, Sec. 4.3.5.2(2)(B), Heavy Metals: Passes requirements.
 - o. ASTM D2047, Coefficient of Friction (Dry): Greater than or equal to 0.6.
 - p. ASTM F970, Static Load Limit: Greater than or equal to 1,000 pounds (surpasses requirements).
 - q. ASTM D4060, Abrasion Resistance: Average of 30,000 cycles (results vary with emboss).

2.03 ACCESSORIES

- A. Moldings, Transition and Edge Strips: Same material as flooring.
- B. Adhesives:
 - 1. VOC Content Limits: As specified in Section 01 61 16.
 - 2. Perimeter glue only with Mohawk Group MS160 Spray adhesive. May also use M95.0 Acrylic adhesive. M95.0 covers 175-225 sf/gallon when applied with the recommended notched trowel. MS160 covers 145-160 sf/22 oz can.

PART 3 EXECUTION

3.01 EXAMINATION .

- A. Install flooring and accessories after other operations (including painting) have been completed.

- B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
 - 1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.
- C. Verify that substrate is contaminant-free.
- D. Test substrates as required by manufacturer to verify proper conditions exist.
 - 1. Concrete:
 - a. Check for concrete additives such as fly ash, curing compounds, hardeners, or other surface treatments that may prevent proper bonding of floor coverings.
 - b. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
 - c. Perform alkalinity testing per ASTM F710 to verify pH level is between 7 to 10.
 - d. Check substrate for absorbency per manufacturer's recommendations.
 - e. Perform bond testing per ASTM F710 to determine compatibility of adhesive to concrete substrate.
 - 2. Wood:
 - a. Shall be dry, clean, structurally sound and installed per underlayment manufacturer's installation instructions.
 - b. Test wood subfloors and underlayment panels using a suitable wood moisture pin-meter. Readings between the subfloor and underlayment panels should be within 3 percent prior to installing the underlayment panels.
 - c. The maximum moisture content is 14 percent.
 - d. Proceed with installation only after satisfactory conditions have been met.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.
- B. Prepare per manufacturer's written instructions, Section 01 70 00, and as follows:
 - 1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.
 - 2. Concrete Substrates: Prepare substrate per ASTM F710.
 - a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
 - b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
 - 1) Do not use solvents or adhesive removers.
 - c. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
 - d. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
 - 1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
 - 2) Sand smooth per manufacturer's instructions.

- e. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
 - f. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
 - g. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.
 - h. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.
3. Wood Substrates or Panel Type Underlayment:
- a. Wood subfloors require an underlayment (double layer construction) with a minimum total thickness of 1 inch and minimum of 18 inches of well ventilated space beneath.
 - 1) Crawl spaces shall be insulated and protected by a vapor barrier.
 - b. Use minimum 0.25 inch thick APA-rated underlayment grade plywood with a fully sanded face or other underlayment panel that is appropriate for the intended usage. Install and prepare panels and seams according to the manufacturer's instructions.

3.03 INSTALLATION

- A. Installation per manufacturer's written instructions, Section 01 70 00, and as follows:
- 1. Layout shall be specified by Architect. Verify with Architect before installation.
 - 2. Follow layout and ensure installation reference lines are square.
 - 3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
 - 4. Check cartons for and do not mix dye lots.
 - 5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
 - a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
 - b. Install movement joint systems per manufacturer's instructions and per Section 07 90 05.
 - 6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
 - a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
 - b. Periodically spot-check transfer of adhesive to back of tile during installation.
 - c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
 - d. Protect floor from traffic per manufacturer's instructions.
 - e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 FIELD QUALITY CONTROL

- A. Site tests and inspections per Section 01 40 00 and as follows:
- 1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
 - a. Lack of adhesion.
 - b. Bubbles, loose tiles or raised edges.
 - c. Dirt and debris underneath flooring.
 - d. Excessive gaps.
 - e. Improper substrate preparation (as indicated by telegraphing).
 - f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.
- B. Non-conforming work per General Conditions and as follows:
- 1. Repair or replace damaged material if not acceptable to the Architect.

3.05 CLEANING

- A. Waste Management per Section 01 70 00 and Section 01 74 19, and as follows:

1. Coordinate material reclamation program with manufacturer, if applicable.
 - a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.
- B. Provide progress cleaning per manufacturer's written instructions, Section 01 70 00, and as follows:
 1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 - a. Clean and protect completed construction until Date of Substantial Completion.
 - b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
 2. Site: Maintain project site free of waste materials and debris.
- C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 70 00.
 1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
 2. Clean floor with a neutral 6-8 pH cleaner.

3.06 MAINTENANCE

- A. Initial maintenance per flooring manufacturer's written instructions and as follows:
 1. Allow the adhesive to cure for at least 48 hours prior to wet cleaning the floor.
 2. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dirt, dust, grit and debris. Do not use vacuums with a beater bar assembly.
 3. Remove any dried adhesive residue from the surface with mineral spirits applied to a clean, lint-free cloth.
 4. Damp mop the floor using a cleaner recommended by the flooring manufacturer.
 5. If necessary, scrub the floor using an auto scrubber or rotary machine (300 rpm or less) with a cleaner recommended by the flooring manufacturer. Maintain the proper dilution ratio and use the appropriate scrubbing brush or pad.
 6. Thoroughly rinse the entire floor with fresh, clean water. Remove the dirty residue with a wet-vacuum or clean mop and allow the floor to dry completely.

3.07 PROTECTION

- A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
 1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
 2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
 3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
 4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2019.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- F. CRI 104 - Standard for Installation of Commercial Carpet; 2015.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Patcraft, www.patcraft.com.

2.02 MATERIALS

- A. Tile Carpeting: Fusion bonded, manufactured in one color dye lot.
 - 1. Product: Collection 10455 Isle Of Sky, Aberdeen manufactured by Patcraft.
 - 2. Tile Size: 12" x 48" inch, nominal.
 - 3. Color: Geary 00525.
 - 4. Pattern: Brick.
 - 5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 7. VOC Content: Comply with Section 01 61 16.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, color as selected by Architect.
- C. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.
- I. Install carpet in pattern as indicated on drawings. If no pattern is indicated, verify with Architect before installation.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Exposed surfaces of steel lintels and ledge angles.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other types of tiles.
 - 9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Shop-primed items.
- B. Section 09 91 23 - Interior Painting.

1.03 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2012).
- D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- F. SSPC-SP 1 - Solvent Cleaning; 2015.
- G. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Samples: Submit two paper chip samples, 10 by 10 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures.
- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 5 gallons of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 4 feet long by 4 feet wide, illustrating paint color, texture, and finish.
- C. Locate where directed by Architect.
- D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
- B. Paints:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As scheduled.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. MATERIALS / FINISHES / COLOR
 - 1. A. Paints
 - a. Any ferrous metal including Steel Doors and Frames, Railing, and Miscellaneous Exposed Pipes – SW DTM Acrylic SG
 - 2. Caulk
 - a. Exterior – SW 950A
- B. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
 - a. Products:
 - 1) PPG Paints Speedhide Exterior Latex Satin, 6-2045XI Series. (MPI #15)
 - 2) PPG Paints Fortis 350 Exterior Latex Satin, 2402G Series. (MPI #214)

- C. Paint E-TR-W - Stain on Wood:
 - 1. 2 coats stain.
 - 2. Stain: Exterior Solid Stain for Wood, Water Based; MPI #16.
 - a. Products:
 - 1) Behr Premium Solid Color Weatherproofing Wood Stain No. 5011 Ultra White (MPI #16).
 - 2) PPG Paints Flood Pro Series Solid Color Stain, FLD 820 Series.
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
- CI. Paint E-TR-C - Transparent Finish on Concrete Floors:
 - 1. Sealer: Water Based for Concrete Floors; MPI #99.
 - a. Products:
 - 1) Behr Premium Wet-Look Sealer Low-Lustre [No. 986]. (MPI #99)
 - 2) PPG Paints Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200. (MPI #99)
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
- CII. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Semi-gloss: Two coats of latex enamel.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Interior/Exterior Latex Block Filler; MPI #4.
 - a. Products:
 - 1) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15. (MPI #4)
 - 2) PPG Paints Concrete Coatings Block Filler, 3010. (MPI #4)
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Latex Primer for Exterior Wood; MPI #6.
 - a. Products:
 - 1) Kilz Premium Water-Based Primer [No. 1300]. (MPI #6)
 - 2) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #6)

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Fiber Cement Siding: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean concrete according to ASTM D4258. Allow to dry.
- H. Masonry:
 1. Prepare surface as recommended by top coat manufacturer.
- I. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- J. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- K. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- L. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- M. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- N. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- O. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.
- P. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- Q. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's written instructions.
- D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- F. Apply each coat to uniform appearance.
- G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- H. Sand wood and metal surfaces lightly between coats to achieve required finish.
- I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming woodwork.
- D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint panels, insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment to match adjacent wall or ceiling surface, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
- E. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished, and must be surface prepped and primed, per this section.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 91 13 - Exterior Painting.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2012).
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; Fourth Edition.

- F. SSPC-SP 1 - Solvent Cleaning; 2015.
- G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- H. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 3. Manufacturer's installation instructions.
 - 4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 5 gallons of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 4 feet long by 4 feet wide, illustrating paint color, texture, and finish.
- C. Locate where directed by Architect.
- D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Transparent Finishes:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 2. PPG Paints. www.ppgpaints.com/#sle.
 - 3. Benjamin Moore & Co.www.benjaminmoore.com.
- D. Stains:
 - 1. PPG Paints Deft Interior Stains: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- E. Primer Sealers: Same manufacturer as top coats.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.
- C. Flammability: Comply with applicable code for surface burning characteristics.

- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

- A. MATERIALS / FINISHES / COLOR
 - 1. **Primers: As recommended by top coat manufacturer for specific substrate unless noted otherwise.**
 - 2. Paints
 - a. Interior Wall Primer – SW PVA B28W0800 for use on new gypsum board surfaces.
 - b. Interior Wall Paint - Gypsum Board – SW Promar 200 ES for use on new gypsum board surfaces.
 - c. Interior Wall Paint - One-coat premium primer and paint in one. For use on previously painted Gypsum Board and wood - IN002100 and IN002400 Series
 - d. Interior Ceiling Paint - Gypsum Board – SW Promar 400 Flat
 - e. Interior Door/Trim – SW Promar 400 ES
 - f. Metal/Steel Doors, Metal/Steel Door Trim, and Exposed Steel Stair Elements – SW DTM Acrylic SG
 - g. Existing Wood Doors - SW ProClassic Acrylic Latex Enamel ES
 - h. Concrete Masonry - SW ProClassic Acrylic Latex Enamel ES
 - 3. Caulk
 - a. Interior – SW 850A

2.04

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
 - 1. One top coat and one coat primer.
 - 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
 - a. Products:
 - 1) PPG Paints Pure Performance Interior Latex, 9-100 Series, Flat. (MPI #143)
 - 2) PPG Paints Pure Performance Interior Latex, 9-500XI Series, Semi-Gloss.
 - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
 - 4) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.
 - 3. Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen for walls and ceilings.
 - b. Satin: MPI gloss level 4; use this sheen for items subject to frequent touching by occupants, including door frames and railings and doors and wood trim.
 - 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
 - 1. One top coat and one coat primer.
 - 2. Top Coat(s): High Performance Architectural Interior Latex; MPI #139, 140, or 141.
 - a. Products:
 - 1) PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-510 Series, Semi-Gloss.
 - 2) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)

- C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, plaster, concrete, concrete masonry units, uncoated steel, shop primed steel, galvanized steel, and aluminum.
 - 1. One top coat and one coat primer.
 - 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
 - a. Products:
 - 1) PPG Paints Pure Performance Interior Latex, 9-100 Series, Flat. (MPI #143)
 - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
- D. Paint I-TR-C - Transparent Finish on Concrete Floors.
 - 1. 1 coat stain.
 - 2. Sealer: Water Based Sealer for Concrete Floors; MPI #99.
 - a. Products:
 - 1) PPG Paints Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200. (MPI #99)
 - 3. Sealer Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen at all locations.

2.05 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
 - a. Products:
 - 1) PPG Paints Speedhide zero Interior Latex Sealer, 6-4900XI. (MPI #149)
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
 - 2. Interior/Exterior Latex Block Filler; MPI #4.
 - a. Products:
 - 1) Kilz Pro-X p50 Block Filler Primer.
 - 2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
 - 3) Substitutions: Section 01 60 00 - Product Requirements.
 - 3. Interior Latex Primer Sealer; MPI #50.
 - a. Products:
 - 1) PPG Paints Speedhide Interior Latex Sealer, 6-2. (MPI #50)
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
 - 4. Interior Drywall Primer Sealer.
 - a. Products:
 - 1) PPG Paints Speedhide Interior Latex Sealer, 6-2.
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
 - 5. Interior Rust-Inhibitive Water Based Primer; MPI #107.
 - a. Products:
 - 1) PPG Paints Pitt-Tech Plus DTM Industrial Primer, 90-912 Series. (MPI #107)
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
 - 6. Stain Blocking Primer, Water Based; MPI #137.
 - a. Products:
 - 1) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #137)
 - 7. Latex Primer for Interior Wood; MPI #39.
 - a. Products:
 - 1) Kilz Premium Water-Based Primer [No. 1300].
 - 2) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #39)
 - 3) Substitutions: Section 01 60 00 - Product Requirements.

2.06 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Plaster and Stucco: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
 - 3. Clean concrete according to ASTM D4258. Allow to dry.
 - 4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

- J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- K. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- L. Galvanized Surfaces:
- M. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- N. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- O. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- P. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 93 00
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of stains and transparent finishes.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 91 23 - Interior Painting: Stains and transparent finishes for concrete substrates.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category.
- C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 6x6 inch (_____ mm) in size.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Stain and Transparent Finish Materials: 1 gallon (4 L) of each color and type; from the same product run, store where directed.
 - 3. Label each container with color and type in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperature: 50 degrees F (10 degrees C) unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.
- B. Provide finishes from the same manufacturer to the greatest extent possible.
- C. Transparent Finishes:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- D. Stains:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood - Floors.
 - 1. 2 coat(s) varnish over 1 coat(s) stain.
 - 2. Stain: Semi-Transparent Stain for Wood; MPI #90.

- a. Products:
 - 1) Sherwin-Williams MinWax 250 VOC Oil Stain. (MPI #90)
- 3. Top Coat Sheen:
 - a. Satin: MPI gloss level 4; use this sheen at all locations.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of stains and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Sand wood surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G. Reinstall items removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 10 21 13
TOILET COMPARTMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Compact Laminate (CL/Solid Phenolic), Moisture Resistant Substrate: Bobrick DuraLineSeries.
 - 1. Toilet partitions.

1.02 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 09 25 23 - Lime Based Plastering.
- D. Section 09 51 23 - Acoustical Tile Ceilings.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
 - 1. Plans, elevations, details of construction and attachment to adjacent construction.
 - 2. Show anchorage locations and accessory items.
 - 3. Verify dimensions with field measurements prior to final production of toilet compartments.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.05 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.09 WARRANTY

- A. Manufacturer's Warranty (DuraLineSeries): Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Bobrick Washroom Equipment, Inc., which is located at: 6901 Tujunga Ave.; North Hollywood, CA 91605-6213; Tel: 818-764-1000; Fax: 818-765-2700; Email:info@bobrick.com; Web:www.bobrick.com
- B. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.
- C. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 COMPACT LAMINATE (SOLID PHENOLIC), MOISTURE RESISTANT SUBSTRATE (DURALINESERIES)

- A. Compact Laminate (Solid Phenolic) Toilet Partitions: Bobrick DuraLineSeries.
 - 1. Design Type:
 - a. Maximum Height:
 - 1) Door/Panel Height: 66 inches (168 cm).
 - 2) Floor Clearance: 6 inches.
 - 3) Panels: Up to 72 inches (183 cm) wide, one piece. Splice or two panels joined by bracket not acceptable.
 - 2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
 - 3. Mounting Configuration:
 - a. Floor-mounted.
 - 1) Stile Height: 72 inches (194 cm).
- B. Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded colored face sheets and black phenolic-resin core.
- C. Edges: Black; brown edges not acceptable.
- D. Color:

1. Color: Other color as selected by architect based on Manufacturer's range and confirmed by the local Manufacturer Representative.
- E. Fire Resistance:
1. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.
 - a. Flame Spread Index (ASTM E 84): 30 for panels and stiles.
 - b. Smoke Developed Index (ASTM E 84): 55 for panels, 20 for stiles.
 2. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class A / Uniform Building Code: Class I.
 - a. Flame Spread Index (ASTM E 84): 15-25 for panels, stiles and doors.
 - b. Smoke Developed Index (ASTM E 84): 25 - 105 for panels, 20-90 for stiles.
- F. Finished Thickness:
1. Stiles and Doors: 3/4 inch (19 mm).
 2. Panels and Screens: 1/2 inch (13 mm).
- G. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches (5 mm) thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
 2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- H. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.
- I. Hardware:
1. Compliance: Operating force of less than 5 lb (2.25 kg).
 2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
 3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.
 4. Doorstops: Prevents inswinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.
 5. Fastening: Hardware is secured to door and stile with pin-in-head Torx stainless steel machine screws. Hinges, latch and optional door stops secured to door with pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners for hinges, latch and optional door stops secured directly into core not acceptable.
 - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
 6. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
 7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
 8. Locking: Door locked from inside by sliding door latch into keeper.
 9. Hinge Type:
 - a. Standard.
 - 1) Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.
 10. Mounting Brackets:
 - a. Standard concealed.
 - 1) Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.

PART 3 PRODUCTS

3.01 PREPARATION

- A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
 - 1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
 - 2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.02 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Use fasteners and anchors suitable for substrate and project conditions
 - 4. Install units rigid, straight, plumb, and level.
 - 5. Conceal evidence of drilling, cutting, and fitting to room finish.
 - 6. Test for proper operation.

3.03 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.
- B. Touch-up, repair or replace damaged products.
- C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Residential toilet and bath accessories.
- B. Electric hand/hair dryers.
- C. Diaper changing stations.
- D. Grab bars.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00: Concealed supports for accessories, including in wall framing and plates, and above ceiling framing.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI A117.1 - Safety Standards for the Handicapped.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).
- G. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and blocking in locations of each wall mounted toilet accessory and grab bars to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Samples: Submit one samples of each accessory, illustrating color and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.06 REGULATORY REQUIREMENTS

- A. Conform to ANSI A117.1 code for access for the handicapped, UFAS and A.D.A. Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Residential Toilet and Bath Accessories:
 - 1. DELTA 4-Piece Trinsic Chrome Decorative Bathroom Hardware Set - Kit includes 24-in towel bar, robe hook, towel ring, and toilet paper holder.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Electric Hand/Hair Dryers:
 - 1. Dyson; www.dyson.com.

- C. Diaper Changing Stations:
 1. Bradley Corporation; www.bradleycorp.com/#sle.
 2. Koala Kare Products; www.koalabear.com/#sle.
 3. Bobrick; www.bobrick.com.
- Cl. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 1. Grind welded joints smooth.
 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Adhesive: Two component epoxy type, waterproof.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized.

2.03 FINISHES

- A. Stainless Steel: No. 4 Brushed finish, unless otherwise noted in community room.
- B. Chrome Plating: ASTM B456, SC 2, polished finish, unless otherwise noted in residential units
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Electric Dryers: Fan-in-case type, with downward nozzle.
 1. Cover: White plastic.

2.05 INSTITUTIONAL LIGATURE-RESISTANT TOILET AND BATH ACCESSORIES

- A. Toilet Paper Holder: Single roll, surface-mounted unit with beveled wall flange, satin finish stainless steel, spring-loaded spindle button type for standard toilet paper rolls. Install with tamper-resistant screws.
- B. Grab Bars: Type 304 stainless steel, smooth surface with closure plate.
 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, 1-1/2 inch clearance between wall and inside of grab bar; 14 gauge stainless steel "L" shaped closure plate with wall mounting flange welded to bottom of tube to prevent ligature. Install grab bar and closure plate with tamper-resistant screws through grab bar circular mounting flange and wall flange of flat closure.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.

2.06 RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES

- A. Medicine Cabinet: One-piece construction of heavy-gage steel with factory-applied, gloss white, baked enamel finish, fully recessed, frameless mirror.
 1. Shelves: Adjustable, aluminum or glass; provide not less than 3 shelves.
 2. Door: Fitted with continuous piano-type hinge, shock-absorbing spring-and-rod door stop, magnetized catch, swing as indicated, size/location as indicated on drawings.
 3. Products:
 - a. Kohler Verdera 24" W x 30" H aluminum medicine cabinet K-99003-NA.
 - b. Kohler Verdera 15" W x 30" H aluminum medicine cabinet K-99000-NA.
- B. Toilet Paper Holder: Surface mounted, single roll, concealed attachment.
 1. Type: Post with hanging holder.
 2. Products:
 - a. Delta Trinsic Series.

- C. Towel Bar: Round ; round mounting posts, concealed attachment.
 - 1. Length: 24 inches.
 - 2. Products:
 - a. Delta Trinsic Series.
- D. Towel Ring: Post with hanging ring, concealed attachment. Polished Chrome
 - 1. Ring Material: To match post material.
 - 2. Products:
 - a. Delta Trinsic Series.
- E. Shower Curtain Rod: Straight tube, 1 inch diameter, with mounting flanges for concealed attachment.
 - 1. Material: Stainless steel; bright polished finish.
 - 2. Length: 60 inches.
- F. Robe Hook: Single-prong, concealed attachment.
 - 1. Material: Chrome-plated zinc alloy; bright polished finish.
 - 2. Products:
 - a. Delta Trinsic.

2.07 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
 - 1. Operation: Automatic, sensor-operated on and off.
 - 2. Mounting: Surface mounted.
 - 3. Cover: Plastic.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 - 4. Electric Hand Dryer Products:
 - a. Dyson Air Blade V: Nickel..
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.08 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Stainless steel.
 - 2. Mounting: Surface.
 - 3. Minimum Rated Load: 250 pounds.

2.09 SCHEDULE

- A. Refer to drawings for general locations, mounting heights and sizes.
- B. Bathrooms (each)

	Quantity
1. Toilet paper holder	1
2. Medicine Cabinet	number and size per dwgs
3. Grab bars	number and size if indicated per dwgs
4. Towel Bar, robe hook and towel ring	1
5. Shower Rod	1
- C. UFAS Apartment Unit Bathrooms (each)

1. Toilet paper holder	1
2. Grab bars	number and size per dwgs
3. Medicine Cabinet	1
4. Towel bar, robe hook, and towel ring	1
5. Shower Rod	1

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions before starting work.
- B. Verify exact location of accessories for installation.

- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section drawings for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations and as indicated on drawings, unless otherwise indicated.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business: www.ansul.com.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 2. Substitutions: As approved by Architect. See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size and classification as scheduled.
 - 3. Finish: Baked polyester powder coat, color as selected by Architect from manufacturer standard colors.
 - 4. Temperature range: Minus 40 degrees F to 120 degrees F.
- C. Fire Extinguishers - In residential units: provide Larsen MP5A-2A10BC fire extinguishers wall mounted in closet or mounted under kitchen sink, within each residential unit. Extinguisher must be tagged and mounted by Tennessee Licensed Fire Extinguisher Co.

- D. Provide and install stove top Williams Pyro FireStop 675-3D stovetop venthood fire suppressors as manufactured by Williams Pyro at each range hood vent, two per stovetop vent hood.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated. Larsen's O-3216
 - 1. Formed stainless steel sheet; 0.036 inch thick base metal.
- C. Fire Rated Cabinet Construction: One-hour fire rated. Larsen's FS O-3216
 - 1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.
- D. Cabinet Configuration: Recessed type; Cabinet Style:Larsen's Occult Series.
 - 1. Size to accommodate accessories.
 - 2. Cabinet trim style - recessed.
 - 3. Trim: Flat square edge, with 2 inch wide face.
 - 4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
 - 5. Door: No glazing, Concealed hinge. Cabinet Projection 0.625". ADA compliant.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Finish of Cabinet Exterior Trim and Door: Provide brass door on First, Second and Third Level. Provide all other levels aluminum door finish..
- G. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

3.03 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

**SECTION 10 55 00
POSTAL SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Central mail delivery boxes.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete pedestal and anchor bolts for mail box.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. 39 CFR 111 - U.S. Postal Service Standard 4C; effective date September 3, 2006.
- C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, maintenance information, and current USPS approval documentation.
- C. Shop Drawings: Indicate plans for each unit or groups of units, front elevations with compartment layout and model number, overall dimensions, rough-in opening sizes, construction and anchorage details.
- D. Samples: Submit two sets of manufacturer's available colors.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty against defects in materials or workmanship for a period of 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CENTRAL MAIL DELIVERY BOXES

- A. Manufacturers:
 - 1. Salsbury Industries: www.mailboxes.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Outdoor Cluster Mailbox: Pedestal-mounted, parcel receptacle with weather-resistant cabinet for outdoor installation.
 - 1. Unit A: Front-loading with master door, single-column design, 12 customer compartments, 1 outgoing mail receptacle, and 1 parcel compartments.
 - a. Salsbury Industries: Salsbury 3412D 12 Door Cluster Mailbox - USPS Approved (Includes Pedestal) Color as selected by Architect from MFG's full color range.

2.02 COMPONENTS

- A. Locking - Parcel Compartment Doors: Double-lock arrangement with USPS approved cam lock for customer access, and USPS master lock furnished and installed by postmaster.
- B. Pedestals: Standard aluminum pedestal with rubber mounting pad designed to meet USPS and height requirements of ADA Standards.
- C. Decorative Cap for Outdoor Units: Formed aluminum, classic crown design.
- D. Pedestal Cover for Outdoor Units: Formed aluminum, classic crown design.

- E. Identification - Customer and Parcel Compartments: Sequential numerical or alphabetic characters, top to bottom, left to right; factory-installed.
 - 1. Engraved characters, 3/4 inch (19 mm) high, with black fill.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete base and anchor bolts are ready to receive pedestal-mounted units.
- B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install postal specialties in accordance with approved shop drawings, manufacturer's instructions, and USPS requirements.
- B. Adjust and lubricate door hardware to operate properly.
- C. Install mailbox identification items.

END OF SECTION

SECTION 10 57 23
CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted wire closet shelving.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking in walls for attachment of shelving.
- B. Section 09 21 16 - Gypsum Board Assemblies: Blocking in stud walls for attachment of standards.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.
- C. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving and attachment to substrates.
- D. Selection Samples: For each color selection required, submit color chips representing manufacturer's full range of available colors and finish.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.
- C. Store flat to prevent warpage and bending.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wire Storage Shelving:
 - 1. ClosetMaid Corporation : www.closetmaid.com/#sle.
 - 2. RubberMaid Closet and Organization Products : www.rubbermaidcloset.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHELVING APPLICATIONS

- A. Shelf Depth: 12 inches (305 mm), unless otherwise indicated.
- B. Master Bedroom Closets:
 - 1. Wall to wall length of shelving as indicated on drawings - with free sliding hanger rod. May be arranged double height.
- C. Other Bedroom Closets:
 - 1. Wall-to-wall shelf with free sliding hanger rod as indicated on drawings.
- D. Coat Closets:
 - 1. Wall-to-wall shelf with free sliding hanger rod.
- E. Linen Closets:
 - 1. Wall-to-wall shelves spaced at 13 inch (330 mm) vertically, not less than 16 inch (408 mm) deep.
- F. Storage Closets:

1. Wall-to-wall storage shelves, close-mesh cross wire spacing, stacked at 13 inch (330 mm) vertically, not less than 12 inch (305 mm) deep.

2.03 MATERIALS

- A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with all components and connections required to produce a rigid structure that is free of buckling and warping.
 1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi (690 MPa) resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
 2. Coating: PVC or epoxy, applied after fabrication, covering all surfaces.
 3. PVC Coating: 9 to 11 mils (0.23 to 0.028 mm) thick.
 4. Epoxy Coating: Non-toxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils (0.76 to 1.27 mm) thick.
 5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch (25.4 mm).
 6. Close-Mesh Shelves: Cross deck wires spaced at 1/2 inch (12.7 mm).
 7. Shelf and Rod Units: Integral hanging rod at front edge of shelf.
 8. Free-Sliding Hanging Rod: Integral hanging rod that permits uninterrupted sliding of hangers the full width of the shelf.
 9. Corner Units: Same wire spacing as standard mesh shelves; provide wherever shelves meet at right angles.
- B. Hanging Rod: Tubular steel, 1 inch (25 mm) diameter, with end caps on open ends.
 1. Finish: Epoxy powder coat.
 2. Wall Thickness: 20 gage, 0.035 inch (0.89 mm).
 3. Provide corner hanging rods and hanging rod connectors where required.
- C. Wall-Mounted Standards: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving.
- D. Mounting Hardware: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.
- E. Fasteners: As recommended by manufacturer for mounting substrates.
- F. Install as shown in drawings and in complete accordance with manufacturer's specifications and details.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect areas to receive shelving, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.
- B. Verify appropriate fastening hardware.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, with shelf surfaces level.
- B. Cap exposed ends of cut wires.

- C. Install back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.
- D. Mounting Heights:
 - 1. Single Hanging Rod Units: Install shelf at 68 inches (1727 mm) above floor.
 - 2. Double Hanging Rod Units: Install shelves at 42 inches (1067 mm) and 84 inches (2134 mm) above floor.
 - 3. Other Shelves: See drawings.

3.04 CLEANING

- A. Clean soiled surfaces after installation.

3.05 PROTECTION

- A. Protect installed work from damage.
- B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

SECTION 10 71 13.13
EXTERIOR SHUTTERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass composite shutters.
- B. Shutter hardware.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
- C. Samples: For each finish product specified, two complete sets of color chips representing manufacturer's standard colors.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened packaging, with labels clearly identifying product name and manufacturer.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials in a clean, cool and dry area in accordance with manufacturer's instructions. Do not leave unopened shutters in direct sunlight.
- D. Protect materials during handling and installation to prevent damage.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for shutters.

PART 2 PRODUCTS

2.01 EXTERIOR SHUTTERS

- A. General:
 - 1. Provide fixed shutters as indicated on drawings.
- B. Material Composition: Fiberglass composite, and as specified below.
- C. Type: Side hung (Colonial).
- D. Thickness: 1 inch (25 mm), nominal.

2.02 PERFORMANCE REQUIREMENTS

- A. Shutters to withstand specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
- B. Design Wind Loads: Comply with requirements of authorities having jurisdiction.

2.03 MATERIALS

- A. Manufacturer's standard shutter construction and materials for selected model or product line.
- B. Fiberglass Composite: Shutters fabricated from individual components of fiberglass and materials noted below.
 - 1. Stiles: Pultruded fiberglass.
 - 2. Rails: Pultruded fiberglass.
 - 3. Louver Slats: Pultruded fiberglass; rounded edges.
 - 4. Panels: High density solid core wood composite material.
 - 5. Joinery: Mortise and tenon.
 - 6. Thermal Stability: Fiberglass louvers and side rails thermally stable from 200 degrees F (93 degrees C) to minus 100 degrees F (minus 38 degrees C).
 - 7. Finish: Shop-applied.
 - 8. Color: As selected by Architect from manufacturer's standard line of colors.

2.04 HARDWARE

- A. Hardware for Side-Hung "Colonial" Shutters: Select from shutter manufacturer's standard options.
 - 1. Material: Stainless steel.
 - 2. Finish: Black matte powder coat.
 - 3. Decorative Hinge Fronts: Attach to inside face of shutter with stainless steel fasteners for display when shutters are open.
 - 4. Holdbacks (Shutter Dogs): Attach to building with stainless steel fasteners to hold shutters open.
 - a. Style: "S" shaped.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Commencement of work will imply acceptance of substrate.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install shutters in accordance with manufacturer's instructions for mounting indicated.

3.04 PROTECTION

- A. Protect installed products from damage by weather and other work until Date of Substantial Completion.
- B. Touch-up and repair damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 11 30 13
RESIDENTIAL APPLIANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.
- B. Section 26 05 83 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Contractor to submit Excel Spreadsheet of serial numbers for all appliances and units in which they are installed for Owner management and tracking.

1.05 QUALITY ASSURANCE

- A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Acceptable Manufacturers:
 - 1. Frigidaire
 - 2. Hotpoint
 - 3. Kenmore
 - 4. Whirlpool
 - 5. General Electric
- C. 1, 2, 3, 4 and 5 BEDROOM units
 - 1. Refrigerator: GTE19DTNRWW 19.1 Cu. Ft. Top Freeze Refrigerator all units
 - 2. Range: GE Model JB625DKWW
 - 3. Vent: JVX3300DJWW
 - 4. Dishwasher: GE GDF530PGMWW
- D. All UFAS UNITS
 - 1. Refrigerator: GTE19DTNRWW 19.1 Cu. Ft. Top Freeze Refrigerator all units
 - 2. Range: GE Model JD630DFWW for UFAS units
 - 3. Vent: JVX3300DJWW
 - 4. Dishwasher: GE GDT225SGLWW for UFAS units
- E. COMMUNITY BUILDING
 - 1. Refrigerator: GIE22JSNRSS 21.9 Cu. Ft. Top Freezer Refrigerator ADA

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

SECTION 11 52 13
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls and ceilings.
- B. Section 09 21 16 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.
- C. Section 09 51 00 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.
- D. Section 09 91 23 - Interior Painting: Field painting.
- E. Section 26 05 83 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.
- D. Samples: For case and frame finishes, submit two samples 6 by 6 inch in size, illustrating color and texture of finish.
- E. Manufacturer's Qualification Statement.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.
- B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.
- C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

- A. Maintain interior of building between 60 degrees F and 78 degrees F during and after installation of projection screens.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

- A. Manufacturers:
 - 1. Da-Lite Screen Company; www.da-lite.com/#sle.
 - 2. Draper, Inc; Access FIT E Electric Projection Screen www.draperinc.com/#sle.
- B. Front Projection Screens: Factory assembled unless otherwise indicated.
 - 1. Dimensions: As indicated on drawings.
 - 2. Located in Community Room: Motorized, matte light diffusing fabric screen, horizontally tensioned, recessed.
- C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
 - 1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
- D. Reflective Screen Fabric: Angularly reflective surface; flame retardant and mildew resistant.
 - 1. Material: Silver finished vinyl on fiberglass backing, with nominal gain of 1.3 on axis, not less than 0.65 at 30 degrees from axis.
- E. Masking Borders: Black, on four sides.
- F. Extra Drops: White; 11 inch wide.
- G. Concealed-in-Ceiling Screen Cases: Steel, with integral roller brackets.
 - 1. Door Slat: Self trim; self-closing and -opening.
 - 2. Case Finish: Baked enamel.
 - 3. Case Color: White.
 - 4. End Caps: Steel; finished to match case.
- H. Electrically-Operated Screens:
 - 1. Roller: Steel, 2 inch in diameter, with locking device.
 - 2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
 - 3. Horizontal Tensioning: Tab-guided cable system.
- I. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 ELECTRICAL COMPONENTS

- A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.
- B. Motors: Direct drive, 110 V, 60 Hz.
 - 1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.
 - a. Electrical Characteristics: 1.2 amps.
 - b. Motor mounted on sound absorber.
 - 2. Door and Adjustable Masking Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
 - a. Electrical Characteristics: 1.2 amps.
- C. Controls: Three (3) position control switch with plate.
 - 1. Remote Control: Infrared; provide one transmitter.
 - 2. Security: Provide key operated switch; provide 2 keys.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is finished and ready to accept screen installation.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that openings for recessed screens are correctly sized.
- D. Verify type and location of electrical connections.
- E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

- A. Coordinate screen installation with installation of projection systems.
- B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install screens in mountings as specified and as indicated on drawings.
- D. Install plumb and level.
- E. Install electrically operated screens ready for connection to power and control systems by others.
- F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
- G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- D. Samples: Submit two samples, 12 inch (304 mm) long illustrating slat materials and finish, cordless type and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Blind Assemblies: One of each size.
 - 3. Extra Slats: 20 of each type and size.
 - 4. Extra Lift Cords, Control Cords, and Wands: One of each type.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Horizontal Louver Blinds:
 - 1. Hunter Douglas: www.hunterdouglas.com.
 - 2. Levolor Contract: www.levolorcontract.com.
 - 3. Lotus: www.lotusblind.com
 - 4. Graber: www.graberblinds.com
 - 5. Mariak Contract.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Source Limitations: Furnish blinds and associated controls produced by a single manufacturer and obtained from a single supplier.

2.02 BLINDS

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Manual Operation: Control of raising and lowering by cordless operation with full range locking; blade angle adjustable by cordless operation.
- C. Plastic Slats: Flat, smooth faux wood PVC slats, square cut corners.
 - 1. Width: 2 inch (50 mm).
 - 2. Thickness: .11 inch (2.79 mm).
 - 3. Color: As indicated on drawings.

- 4. Texture: Smooth.
- D. Slat Support: Woven polypropylene cord, ladder configuration.
- E. Head Rail: Pre-finished, formed steel box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
 - 1. Color: Same as slats.
- F. Bottom Rail: Pre-finished, formed PVC; with end caps.
 - 1. Color: Same as headrail.
- G. Control Wand: Extruded hollow plastic; hexagonal shape.
 - 1. Length of window opening height less 3 inch (76 mm).
 - 2. Color: As selected by Architect.
- H. Headrail Attachment: Wall brackets.
- I. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

- A. Determine sizes by field measurement of opening.
- B. Fabricate blinds to cover window frames completely.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed. See Section 06 10 00.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).
- B. Maximum Offset From Level: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 12 35 30
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen and vanity cabinets.
- B. Casework hardware.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.
- B. Section 12 36 00 - Countertops

1.03 REFERENCE STANDARDS

- A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- B. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets; 2017.
- C. KCMA (DIR) - Directory of Certified Cabinet Manufacturers; current edition, online.
- D. The Quality Standards of the American Woodwork Industry shall apply and by reference are made a part of this specification. Cabinets shall comply with the requirements of ANSI 161.1-1990 standards.
- E. High pressure laminated plastic panel Hema LO-1.
- F. Soft Wood Ply Wood PS-1.
- G. Non-pressure treated millwork CS 262 or NWMA IS-4.
- H. Cabinetry to conform to the performance and fabrication requirements of HUD Severe Use.
- I. Product shall bear the KCMA Certification Seal.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, configurations, and construction details.
- C. Certificate: Submit Kitchen Cabinet Manufacturers Association (KCMA) certificate showing conformance with KCMA A161.1.
- D. Certificate: Submit Kitchen Cabinet Manufacturers Association (KCMA) certificate showing manufacturer has met the requirements of KCMA's Environmental Stewardship Program (ESP).
- E. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.
- F. Cabinet Finish Sample: Submit two samples of each type of finish, 2 inches by 3 inches (51 mm by 75 mm) in size, illustrating color, texture, gloss, and wood species.
- G. Cabinet Door and Drawer Sample: Of sufficient size to show cabinet style and finish, with selected hardware.
- H. Manufacturer's Qualification Statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Samples: Submit two doors, 12x12 inch in size, illustrating each color of finish.

1.05 QUALITY ASSURANCE

- A. Products: Cabinets complying with requirements of KCMA's Environmental Stewardship Program (ESP).

- B. Products: Complying with KCMA A161.1 and KCMA Certified.
- C. Manufacturer: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- D. The Architect reserves the right to approve the woodwork manufacturer selected to furnish all of the woodwork. The approved woodwork manufacturer must have a reputation for doing satisfactory work on time and shall have successfully completed comparable work.

1.06 MOCK-UP

- A. Provide full size mock-up of casework base unit.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

1.08 DELIVERY AND STORAGE

- A. The Woodwork Manufacturer and the General Contractor shall jointly be responsible to make certain that items of woodwork are not delivered until the building and storage area is sufficiently dry so that the woodwork will not be damaged by excessive changes in moisture content.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Residential Casework: Full Overlay Maple Cabinetry, Shaker doors/Flat drawers; Finish: As selected from mfg's full range of painted and stained cabinetry.
- B. Manufacturers:
 1. Kraftmaid Cabinetry, Inc: www.kraftmaid.com/#sle.
 2. Aristokraft Cabinetry; www.aristokraft.com
 3. Rutledge Maple Cabinetry by Advanta Cabinets; www.advantacabinets.com
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Cabinet Construction: Softwood lumber framing and plywood.
- B. Plywood, not noted otherwise, shall be Interior A-A where exposed both sides and A-D for one side exposure. All plywood shall be grade marked.
- C. 5/8" Solid Dovetail Drawer features four sided construction and captive 1/4" matching laminate bottom.
- D. 6-way Adjustable Hinges - self-closing and concealed within the cabinet door and frame.
- E. Hardwood face frames: 3/4" thick and 1-1/2" wide kiln-dried hardwood. Frames assembled under pressure with screws.
- F. Standard 1/2" Back and Sides available as a plywood upgrade.
- G. Exposed ends shall have finished panel to match cabinetry front.
- H. Kitchen Countertop: Plastic Laminate as designated in Finish Schedule on drawings. Reference 12 36 00 Countertops. Self edged. Provide radiused edges at counter corners as indicated on drawings.
- I. Vanity Countertop: Cultured Marble with integral sink - see Finish Schedule.
- J. Door and Drawer Fronts: Solid wood.
- K. Bolts, Nuts, Washers and Screws: Of size and type to suit application.
- L. Concealed Joint Fasteners: Threaded steel.

2.03 HARDWARE

- A. Hardware: BHMA A156.9
- B. Cabinet hardware shall be heavy-duty pivot hinges with magnetic catches and concealed parts brushed nickel finish. Cabinet drawer and door pulls shall be provided to meet ADFA, ADA and Fair Housing accessibility guidelines. Supporting hardware shall be designed for total loads and types of adjacent construction with a safety factor not less than 2. Hardware shall support the following loads:
 - 1. 20 lb. load on front of each cabinet door secured as far as possible from hinges and each door operated slowly through 10 openings (full swing) and 10 closings.
 - 2. Same test for Base Cabinet Doors using a 30 lb. load.
- C. Shelf Standards and Rests: Vertical steel standards with rubber button fitted steel rests.
- D. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
- E. Drawer and Door Pulls: Richelieu Contemporary Metal Center Bar Pull - finish satin chrome, 5 inches wide.
- F. Catches: Magnetic.
- G. Drawer Slides: Extension arms, steel construction.

2.04 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fabricate corners and joints without gaps.
- C. Fabricate each unit to be rigid and not dependent on building structure for rigidity.
- D. Form smooth edges. Form material for countertops and shelves from continuous sheets.
- E. Provide cutouts for plumbing fixtures and appliances. Prime paint contact surfaces of cut edges.
- F. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 FINISHES

- A. Exposed To View Surfaces: Stain, seal, and varnish finish panel to match cabinetry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of support framing.

3.02 INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Installation shall comply with AWI Custom Grade Casework and current manuf. installation instructions.
- C. Use anchoring devices to suit conditions and substrate materials encountered.
- D. Set casework items plumb and square, securely anchored to building structure.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/8 inch (_____ mm).
- F. Close ends of units, back splashes, shelves and bases.

3.03 ADJUSTING

- A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly.

3.04 CLEANING

- A. Clean casework, countertops, shelves, and hardware.

3.05 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

**SECTION 12 36 00
COUNTERTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for manufactured casework.
- B. Sinks molded into countertops.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 12 35 30 - Residential Casework.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- D. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- E. ASTM C 97 – Standard Test Methods for Absorption and Bulk Specific Gravity of Dimensions Stone; 2009.
- F. ASTM C 880 – Standard Test Method for Flexural Strength of Dimension Stone; 2009.
- G. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 2007, Edition 1.
- H. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2010
- I. ASTM E 228 – Standard Test Method for Linear Thermal Expansion of Solid Materials with a Puch-Rod Dilatometer; 2006.
- J. ASTM G 21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2009.
- K. ISSFA-2-01 – Classification and Standards for Solid Surfacing Materials; 2007.
- L. MIA (DSDM) - Dimensional Stone Design Manual; VII, 2007.
- M. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- N. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.
- O. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project and shall be acceptable to or licensed by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. Furnish manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 - a. Manufacturers:
 - 1) Formica Corporation: www.formica.com.
 - 2) Wilsonart: www.wilsonart.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. NSF approved for food contact.
 - d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - e. Laminate Core Color: Same as decorative surface.
 - f. Finish: Matte or suede, gloss rating of 5 to 20.
 - g. Surface Color and Pattern: As indicated on drawings.
 2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
 3. Back and End Splashes: Same material, same construction where indicated on drawings.
 4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.
- C. Natural Quartz Countertops: Sheet or slab of natural quartz self-supporting over structural members.
 1. Flat Sheet Thickness: 1 1/4"
 2. Natural Quartz, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyesterorthophthalic polyester resin, mineral fillermineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using

standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.

- a. Manufacturers:
 - 1) Corian: www.corian - QZ-1 Color: Neve
 - 2) Cambria: www.cambriausa.com - QZ-2 Color: Hawksmore
 - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
 - c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - d. NSF approved for food contact.
 - e. Sinks: Prepare opening for undercounter mounting; size in inches as required by sink/fixture size; verify deck mounting required for faucet.
 - f. Finish on Exposed Surfaces: Polished.
 - g. Color and Pattern: As indicated on drawings.
3. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
 4. Skirts: As indicated on drawings.
 5. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

- A. Wood-Based Components:
 1. Wood fabricated from old growth timber is not permitted.
 2. Provide wood harvested within a 500 mile radius of the project site.
 3. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.
- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. Joint Sealant: Mildew-resistant silicone sealant, FDA/UL® recognized, color matched or clear.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 1. Join lengths of tops using best method recommended by manufacturer.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash in counters with a sink wherever counter edge abuts vertical surface unless otherwise indicated.
 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches, unless otherwise indicated.
- C. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Seal joint between back/end splashes and vertical surfaces.
 - 1. Where applied cove molding is not indicated use specified sealant.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 07 19
PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- C. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.
- F. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER

- A. Insulation: ASTM C 547; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 850 degrees F (454 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.

- B. Insulation: ASTM C 547; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 650 degrees F (343 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
 - 1. ASTM C 195; hydraulic setting on mineral wool.
- G. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- H. Outdoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- I. Insulating Cement:
 - 1. ASTM C 449/C 449M.

2.3 CLOSED CELL MOLDED

- A. Insulation: ASTM C 578; rigid closed cell.
 - 1. 'K' ('Ksi') value: 0.23 at 75 degrees F (0.033 at 24 degrees C).
 - 2. Maximum service temperature: 165 degrees F (74 degrees C).
 - 3. Maximum water vapor permeance: 5.0 perms (287 ng/Pa s sq m)

2.4 JACKETS

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (-18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.00029 ng/Pa s sq m), maximum, when tested in accordance with ASTM E 96.
 - d. Thickness: 15 mil (0.38 mm).
 - e. Connections: Brush on welding adhesive.
 - 2. Covering Adhesive Mastic:
 - a. Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to drawings.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

3.3 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Water Supply:
 - a. Closed Cell Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1/2 inch Cold Water except for Pex piping, 3/4" Hot Water.
- B. Cooling and Heating Systems:
 - 1. Cold Condensate Drains and drains accepting condensate: All sizes, Glass Fiber 1 1/2 ".
 - 2. Refrigerant Suction: Closed Cell in accordance with Manufacturer's instructions.
 - 3. Refrigerant Hot Gas: Closed Cell in accordance with Manufacturer's instructions.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Natural Gas.

1.2 REFERENCES

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).
- D. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM B 32 - Standard Specification for Solder Metal.
- F. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- G. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- H. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- I. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- J. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- K. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- L. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
- M. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- N. AWWA C651 - Disinfecting Water Mains; American Water Works Association; (ANSI/AWWA C651).
- O. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

- P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- Q. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.
- R. ASTM D 1784 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.3 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with local standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.5 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with plumbing code.
- B. Conform to local requirements for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

1.8 EXTRA MATERIALS

- A. Provide two repacking kits for each size valve.

PART 2 PRODUCTS

2.1 SANITARY AND STORM SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. PVC Pipe: ASTM D 2665 or ASTM D 3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.2 SANITARY AND STORM SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D 1785 Schedule 40, or ASTM D 2241 SDR 26 for not less than 150 psi (1034 kPa) pressure rating.
 - 1. Fittings: ASTM D 2466, PVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement. Mechanical joint restraints on bottom 20' of vertical stacks and to 20' once turned horizontal (except buried).

2.3 WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B 42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B 32, alloy Sn95 solder.

2.4 WATER PIPING, ABOVE GRADE

- A. CPVC Pipe: ASTM D 1784 Schedule 80.
 - 1. Fittings: ASTM D 1784, CPVC.
 - 2. Joints: Solvent welded, with ASTM D 2564 Solvent cement.

- B. Polyethylene (PEX) Tubing: ASTM F876/F877.
 - 1. Fittings: ASTM F1281 Expansion Fittings
 - 2. Joints: Expansion.

2.5 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
 - 2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch (25 mm):
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.
 - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- B. Plumbing Piping - Water:
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.

5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

2.8 GATE VALVES

- A. Up To and Including 3 Inches (80 mm): MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, threaded ends.

2.9 BALL VALVES

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded ends with union.

2.10 BUTTERFLY VALVES

- A. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 150 psi CWP, cast or ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, grooved ends, extended neck, infinite position lever handle with memory stop.

2.11 FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet, temperature and pressure test plug on inlet.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- P. Install water piping to ASME B31.9.
- Q. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- R. Sleeve pipes passing through partitions, walls and floors.
- S. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- T. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Refer to Section 099000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 10. Provide hangers adjacent to motor driven equipment with vibration isolation.

3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.

- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide flow controls in water recirculating systems where indicated.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in natural gas systems for shut-off service.

3.5 ERECTION TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum hanger spacing: 6.5 ft (2 m).
 - 2) Hanger rod diameter: 3/8 inches (9 mm).
 - b. Pipe size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).
 - c. Pipe size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 1/2 inch (13 mm).
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum hanger spacing: 4 ft (1.2 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 23 00 01
MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 REFER TO DIVISION 1 FOR FULL PROJECT SCOPE OF WORK

1.2 MECHANICAL SCOPE OF WORK

- A. Heating, ventilating, air conditioning systems, plumbing, and other piping systems modifications as specified; complete and in operating order.
- B. Maintenance of heating and air conditioning equipment used for temporary heating, cooling, and for testing.
- C. Installation of all mechanical control components which require mechanical connections only, both mechanical and electrical connections, penetrations of air plenums and ducts, or installations into piping systems.
- D. All low voltage and line voltage control wiring, conduit, and devices for systems furnished under this division.
- E. Counterflashing of penetrations of roof or exterior walls by pipes, ducts, or other Work under this Division.
- F. Cutting and patching required due to omissions in the installation of Work under this Division, or due to failure to properly coordinate Work with other Divisions.
- G. Painting and labeling of pipe, ductwork, equipment, and devices furnished under this Division.
- H. Furnish access panels required for equipment furnished and installed under this Division.

1.3 RELATED ELECTRICAL WORK

- A. Wiring and conduit for electrical power shall be furnished and installed under Division 26.

1.4 OTHER RELATED WORK UNDER OTHER DIVISIONS

- A. Flashing of ducts and pipes into roofs and outside walls.
- B. Holes, chases, and recesses required for mechanical work.
- C. Miscellaneous steel including equipment supports.

1.5 CONFLICTS

- A. Designer shall be notified in writing at least ten (10) days prior to the Bid Date of any conflicts or items requiring clarification. Resolution shall be only by written notice from the Designer. Oral clarifications shall be confirmed in writing.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. The requirements listed below are given as a supplement to those in Division 1 and do not relieve the Contractor of complying with any and all applicable regulatory requirements set forth in this Specification.
- B. Obtain and pay for the required permits, inspection fees, tapping fees, connection charges, and utility company service charges.
- C. The mechanical work installation shall comply with State and local Health Departments and Building Codes, applicable Life Safety Code, State and local ordinances, and with NFPA Standard 90A and 90B.
- D. Equipment shall be U.L. listed. All installations shall comply with U.L. standards, where applicable.
- E. Equipment and Work shall comply with existing noise and safety standards.

- F. Certificates of compliance from authorities having jurisdiction shall be transmitted to the

Engineer and the Owner. Complete all work, pay all fees, and arrange for tests to obtain certificates of compliance.

1.7 SUBMITTALS

- A. Submit to the Designer for review certified shop drawings on material furnished under this division as listed below. Submittal data shall be checked and stamped approved by the Contractor prior to his transmitting to the Designer. Refer to Division 1 for additional requirements.
- B. Submittals shall be bound in three-ring binders and indexed with a table of contents for each indexed section. Table of contents shall list item, manufacturer, and model number. Large drawings shall be attached to binder or inserted in pockets of binder.
- C. Submittal books shall be complete with all information required for this project prior to submittal. Submittals will be reviewed two (2) times only. The first review will include all items submitted. The second review will verify that comments noted on the first review have been resolved. Additional reviews required due to failure of Contractor to comply with Contract documents shall be at the Contractor's expense.
- D. Submittals shall contain rating data, accessories and features, the same as listed in specifications and capacities, shall be stated in the terms specified. Deviations from specifications and drawings shall be noted on the submittal. If none are noted, it shall be assumed the material meets the specified requirements fully.
- E. Where preprinted manufacturer's data describes more than one (1) product, mark submittals to indicate the specific product to be provided for this Project. Delete or mark out significant portions of pre-printed data which is not applicable. Where operating curves, graphs, etc. are required, mark the operating point or range for the Project.
- F. Requests for substitution of products not specifically named shall be submitted in writing a minimum of fourteen (14) calendar days prior to the bid date. Requests shall include section number, items, name of manufacturer to be substituted, and catalog data. Requests shall be reviewed only to approve or reject submission of detailed submittals as noted in other paragraphs of this Section.
- G. Acceptable manufacturers are noted in each section. Do not substitute materials, equipment, or methods unless such substitution has been approved in writing. Where the phrase "approved equal" appears, do not assume that materials, equipment, or methods will be approved until specific written approval has been given. The burden of proof for requested substitutions rests with the Contractor.
- H. Approved substitution requiring variations in quantity or arrangement of materials, or equipment from that specified, or indicated on drawings shall be furnished and installed by the Contractor at no additional cost to the Owner.
- I. Work shall not proceed until submittals for equipment and shop drawings have been approved. Work installed using unapproved substitutions shall be replaced at no additional cost to the Owner.

1.8 GUARANTEE, MAINTENANCE, AND OPERATING INSTRUCTIONS

- A. Guarantee
Refer to Division 1 for additional requirements for guarantees.
 - 1. Equipment shall be turned over to Owner clean and in complete working order with full one (1) year warranty by the manufacturer. Use of equipment for temporary heating or cooling shall not be included as part of the warranty period.
- B. Maintenance
 - 1. Work furnished and installed under this Division shall be maintained including inspection, lubrication, etc., in accordance with manufacturer's recommendations until acceptance of

system by Owner.

C. Operating Instructions:

1. Refer to Division 1 for O & M Requirements.

1.9 RECORD DRAWINGS

- A. At completion of Work, prepare mechanical record drawings to accurate scale. Drawings shall indicate piping connections, other service connections, and interfaces with other Work including structural supports.
- B. Indicate portions of mechanical Work shown on record drawings which deviate from Work as indicated in the contract drawings and note the reasons for such deviations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 23 05 01
BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 WORK DESCRIPTION

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 PRODUCTS

2.1 ELECTRICAL EQUIPMENT

- A. Motor controllers, protective devices, etc. for control and protection of equipment shall be furnished with the equipment; but installed and electrically connected to power source under "Electrical Division".
- B. NEMA Standards shall be taken as a minimum requirement for electrical equipment.
- C. Equipment shall operate properly under a 10% plus or minus frequency variation.
- D. Unless noted otherwise, motors shall be squirrel-cage induction type with ball bearings. Motors 1/2HP and smaller shall be 120 volts, single phase with permanently lubricated bearings; 3/4 HP and larger shall be 3 phase, general purpose, Design "B" or "C", drip proof type. Verify characteristics of available current at the building before equipment is ordered.
- E. Motors shall be in accordance with IEE, UL and NEMA Standards, non-radio interfering type, rated for continuous, full-load duty and capable of withstanding momentary overloads of 50%. Select motors so actual loads does not exceed nameplate rating, and does not use motor "service factor". "Open" motors shall be rated 40 degrees C.; "totally enclosed" type shall be 50-degrees C. rated. Motors over 5 HP shall be "high efficiency" type and so labeled.
- F. Provide both overload and under-voltage protection in all phases.
- G. Except where interlock or automatic control is required, single speed motors, and smaller than 1/2 HP have manual switch with pilot light and thermal overload protection. H. For manual operation of 3/4 HP and larger motors, furnish magnetic starter with:
 - 1. Maintained contact PB and pilot light or momentary contact pushbutton station and pilot when directed.
 - 2. Trip free, thermal overload relays.
 - 3. Capable of accepting electrical interlocks.
- H. Where interlock or automatic operation is specified, regardless of HP, provide magnetic starter complete with RUN/OFF/AUTO switch so connected that in "RUN" or "AUTO" all safety controls shall stop the motor.
- I. All magnetic starters shall have control circuits individually fused from line side of starter, or load side of breaker. All starters on service 200 volts and above shall have 120 volt, built-in control circuit transformer fused on line and load side.
- J. Provide dual element fused disconnect for all hermetic motors above 3/4 HP.
- K. Heating Equipment: Phase and voltage as noted or unless noted otherwise.
- L. Contactors shall be UL listed for 100,000 cycles of operation.
- M. Normal operation pilot lights shall be green; emergency condition signal lights shall be red.

2.2 EQUIPMENT ACCESSORIES

- A. AS NOTED UNDER SPECIFIC EQUIPMENT SCHEDULES AND SPECIFICATIONS.

2.3 ACCESS PANELS

- A. Provide access panels, or doors, at concealed dampers, valves, shock absorbers, vents, trap primers, inspection points, etc. and where noted. Panels shall be galvanized steel, 16 gauge frame, 14 gauge door with mounting accessories, spring hinges, screwdriver operated lock, and prime coat paint. Milcor "A" for acoustic tile, "M" for exposed masonry, "K" for plaster finishes, stainless steel for ceramic, or glazed structural tile. Where ceiling is "lift out" construction, ceiling access panels are not required. Panels shall be 18" x 18" or larger, as required for service intended.
- B. Access doors giving access to "live" electrical gear shall have switch to cut off power when opened.
- C. Access panels in fire rated construction shall have a UL label, Class B rating.

2.4 CONCRETE

- A. Where required for thrust blocks, pipe system encasement, equipment bases, etc. for Division 21, 22, and 23, provide 3,000 PSI concrete.

PART 3 EXECUTION

3.1 ELECTRICAL WORK

- A. All electrical work shall be provided under "Electrical Division 26", except: (1) motor controls (2) interlock circuits, (3) control circuits, (4) temperature-humidity controls. For these excepted items, this division shall provide conduit, wiring, connections, etc. as required for a complete control installation according to the appropriate sections of Specifications.
- B. The work under this Division shall be of the same type and quality as specified under "Electrical Division".

3.2 EXCAVATION, SHORING AND BACKFILL

- A. Provide any excavation required for this Division below that needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate trench for each utility.
- C. Provide: (1) bracing, shoring, etc. to protect sides of excavation, (2) staging, suitable ladders, barricades, etc. Comply with local regulations, or absence thereof with Division of the Manual of Accident Prevention provided for in Construction of the AGC.
- D. Remove all timber before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill material shall be approved clay or chert, free of debris, rock larger than 1%" or other harmful material.
- E. All backfilling shall be compacted to 90% under sidewalks, or grass areas, and to 95% when under paved areas, structures, building slabs, steps, etc. These percentages refer to "Percent of Maximum Density" per ASTM #D-1557. If more stringent, compact backfill to a dry density equal to that required by G.C.
- F. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.

3.3 CUTTING AND PATCHING

- A. Provide all cutting, patching, etc. incidental to this work.
- B. Do not cut into any structural element without written approval of Structural Engineer.
- C. Patching shall be: (1) of quality equal to, and of appearance matching existing construction, and (2) shall restore all services and construction which remains in use to its condition prior to this contract, unless otherwise noted.

3.4 PIPING THRU RATED WALLS AND FLOORS

- A. Insulation on pipe passing thru fire rated walls must stop at pipe sleeve unless 3M fire barrier fire stopping is used. Space between pipe and sleeve shall be protected with 3M Fire Barrier Penetration Sealing System or approved substitute. Installation shall be in accordance with the manufacturers recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. Maintain vapor barrier on insulated chilled water and refrigerant suction piping.
- B. PVC pipe passing through rated walls or floors shall have 3M UL Modified Fire Stop System, Pro-Set System or Hilti.
- C. Refer to details on drawing for pipe and duct penetration thru rated walls and floors.

3.5 FLASHING

- A. Where pipes, ducts, etc. pass through roof, flash per manufacturers recommendations.
- B. Locate pipes, ducts, etc. through roof to clear parapets, etc. by at least 18".
- C. Provide flashing or caulking as required at each opening through outside walls or roof. Flashing through roof of same materials and methods as under "Moisture Protection Division"; through walls shall be aluminum unless noted otherwise.

3.6 PROTECTION

- A. Work shall be protected at all times. Pipe openings shall be closed with caps or plugs until permanent connections are made. Fixtures and equipment shall be covered if necessary, to protect against dirt, water, chemical or mechanical damage or defacement.
- B. All piping indicated to be installed above ceilings in walls or crawl spaces, shall be placed on the heated space side of the building insulation to prevent freezing. Piping indicated to be installed in areas outside heated envelope to be protected by the application of electric heat tape under pipe insulation. The Contractor shall be responsible in contacting the Architect/Engineer before installing and subjecting any piping to freezing conditions.

3.7 TEMPORARY WORK:

- A. Water and electricity consumed during construction shall be paid for by General Contractor.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCES

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

- A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit to the Engineer within two weeks after completion of testing, adjusting, and balancing.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in I-P (inch-pound) units only.
 - 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Project altitude.
 - j. Report date.

- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.4 QUALITY ASSURANCE (moved to PART 3)

1.5 PRE-BALANCING MEETING (moved to PART 3)

1.6 SEQUENCING AND SCHEDULING (moved to PART 3)

1.7 WARRANTY (moved to PART 3)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE STD 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
 - 5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of 5 years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 - c. TABBB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
- E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
 - C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 1. Running log of events and issues.
 2. Discrepancies, deficient or uncompleted work by others.
 3. Contract interpretation requests.
 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure.

3.7 SCOPE

- A. Test, adjust, and balance the following:
 - 1. All new systems
 - 2. Recirculation of Potable Hot Water Systems
 - 3. Heating/Cooling Units
 - 4. Air Handling Units
 - 5. Fans
 - 6. Air Filters
 - 7. Air Terminal Units
 - 8. Air Inlets and Outlets

3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore
- B. V-Belt Drives:
 - 1. Identification/location
 - 2. Required driven RPM
 - 3. Driven sheave, diameter and RPM
 - 4. Belt, size and quantity
 - 5. Motor sheave diameter and RPM
 - 6. Center to center distance, maximum, minimum, and actual
- C. Air Moving Equipment:
 - 1. Location

2. Manufacturer
 3. Model number
 4. Serial number
 5. Arrangement/Class/Discharge
 6. Air flow, specified and actual
 7. Return air flow, specified and actual
 8. Outside air flow, specified and actual
 9. Total static pressure (total external), specified and actual
 10. Inlet pressure
 11. Discharge pressure
 12. Sheave Make/Size/Bore
 13. Number of Belts/Make/Size
 14. Fan RPM
 15. Total HW and CHW flow, specified and actual
- D. Return Air/Outside Air:
1. Identification/location
 2. Design air flow
 3. Actual air flow
 4. Design return air flow
 5. Actual return air flow
 6. Design outside air flow
 7. Actual outside air flow
 8. Return air temperature
 9. Outside air temperature
- E. Exhaust Fans:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Air flow, specified and actual
 6. Total static pressure (total external), specified and actual
 7. Inlet pressure
 8. Discharge pressure
 9. Sheave Make/Size/Bore
 10. Number of Belts/Make/Size
 11. Fan RPM
- F. Air Distribution Tests:
1. Air terminal number
 2. Room number/location
 3. Terminal type
 4. Terminal size
 5. Area factor

6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

G. Potable Water:

1. Location of circuit setter
2. Design Flow
3. Actual Flow

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.

1.2 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.

2.2 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C 553; flexible, noncombustible blanket.
 - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C 518.
 - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- E. Tie Wire: Annealed steel, 16 gage (1.5 mm).

2.3 GLASS FIBER, RIGID

- A. Insulation: ASTM C 612; rigid, noncombustible blanket.
1. 'K' ('Ksi') value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C 518.
 2. Maximum service temperature: 450 degrees F (232 degrees C).
 3. Maximum Water Vapor Sorption: 5.0 percent.
 4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).
- B. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s sq m), when tested in accordance with ASTM E 96.
 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
 2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.4 JACKETS

- A. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
1. Thickness: 0.016 inch (0.40 mm) sheet.
 2. Finish: Smooth.
 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

- D. Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms: Finish with aluminum jacket.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- G. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.3 SCHEDULES

- A. Supply and Fresh Air Ducts: Glass Fiber 2" Thick.
- B. Return and Relief Ducts in Mechanical Rooms: Glass Fiber, 1-1/2" Thick.
- C. Ducts Exposed to Outdoors: Glass Fiber 2-1/2" Thick.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Ductwork Cleaning.

1.2 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.
- E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.
- F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.3 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience.

1.6 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel.
- B. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 250 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
 - 4. For Use with Flexible Ducts: UL labeled.
- D. Hanger Rod: ASTM A 36/A 36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 MANUFACTURED METAL DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

2.4 KITCHEN HOOD DUCTWORK AND FITTINGS

- A. Provide in accordance with IMC 2012, NFPA 96 and details on design drawings. Maintain required slope and avoid cavities where grease can collect. Provide access doors for maintenance.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- F. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect terminal units to supply ducts with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- I. Connect diffusers or light troffer boots to low pressure ducts with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- J. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- K. Set plenum doors 6 to 12 inches (150 to 300 mm) above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connections.
- H. Smoke dampers.
- I. Volume control dampers.

1.2 REFERENCES

- A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- B. NFPA 92A - Standard on Smoke-Control Systems; National Fire Protection Association.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.

1.3 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.4 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors, test holes, and all dampers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

1.7 EXTRA MATERIALS

- A. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

- A. Gravity Backdraft Dampers, Size 18 x 18 inches (450 x 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- B. Provide factory sleeve and collar for each damper.
- C. Multiple Blade Dampers: Fabricate with 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- D. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on exterior of duct and link to damper operating shaft.
- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices.
- F. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.6 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- B. Ceiling Dampers: Galvanized steel, 22 gage (0.76 mm) frame and 16 gage (1.5 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side with locking clip.
- C. Horizontal Dampers: Galvanized steel, 22 gage (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 2 inches (50 mm).
 - 2. Metal: 3 inches (75 mm) wide, 24 gage (0.6 mm) thick galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch (14 mm) thick, 0.87 lbs per sq ft (4.2 kg/sq m), 10 dB attenuation in 10 to 10,000 Hz range.

2.8 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 curtain type fire damper, normally open automatically operated by electric actuator.

- C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.9 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- E. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.
- B. Provide back draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated. Provide 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

1.2 REFERENCES

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.
- B. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

1.3 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

PART 2 PRODUCTS

2.1 ROUND CEILING DIFFUSERS – See Drawings

2.2 RECTANGULAR CEILING DIFFUSERS – See Drawings

2.3 CEILING EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings

2.4 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES – See Drawings

2.5 LOUVERS

- A. Type: 4 inch (100 mm) deep with blades on 45 degree slope, heavy channel frame, 1/2 inch (13 mm) square mesh screen over exhaust and 1/2 inch (13 mm) square mesh screen over intake.
- B. Fabrication: 16 gage (1.50 mm) thick galvanized steel welded assembly, with factory baked enamel finish, color to be selected.
- C. Mounting: Furnish with screw holes in jambs for installation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 23 76 55
SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air-source heat pumps and cooling units.
- B. Air cooled condensing units.
- C. Indoor air handler (fan & coil) units for non-ducted and ducted connections.

1.2 REFERENCES

- A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning and Refrigeration Institute.
- B. ARI 520 - Positive Displacement Condensing Units; Air-Conditioning and Refrigeration Institute.
- C. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- D. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- E. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- F. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

1.3 SUBMITTALS

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- C. Design Data: Indicate refrigerant pipe sizing.
- D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
 - 1. Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 as indicated on drawings; seasonal efficiency to ASHRAE Std 103.

- C. Electrical Characteristics:
 - 1. Disconnect Switch: Provided under Division 26.

2.2 INDOOR UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
 - 2. Manufacturers: System manufacturer.
- E. Furnaces: UL listed and manufactured integral to air handling unit at listed capacities on schedules.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

- A. Ceiling Cassette Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Four-way 2'x2' ceiling-cassette indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability as specified. Wide air-flow pattern with ventilation air intake knockout. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Automatic fan speed control; auto restart following a power outage. Auto wave airflow in heating mode—unit independently cycles through horizontal and vertical positions for more even heat distribution.
- B. Indoor Wall Mounted Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer. Wall mounted indoor unit with built-in drain pump mechanism for condensate removal. Low Ambient cooling capability to 0 degrees F and reverse cycle heating capability where specified in heat pump configuration. Air filter included with unit. Indoor unit powered from outdoor unit with control transformer. Auto restart following a power outage.
- C. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.

2.4 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Compressor: ARI 520; hermetic, two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion and reversing valves for heat pump operation.
- D. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting. Thermostat shall allow occupied and unoccupied settings from BAS and have an occupied mode override. Provide outdoor coil defrost control. Unit shall be capable of operating with automatic changeover in cooling or reverse cycle heating, and auxiliary heating modes.
- E. Unit shall be capable of operating to 0 degrees F.

2.5 AUXILIARY HEAT/ELECTRIC FURNACE COMPONENTS

- A. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental stages of 5 kW each, with porcelain insulators.
- B. Operating Controls:
 - 1. Heater stages energized in sequence with pre-determined delay between heating stages.
 - 2. High limit temperature control to de-energize heating elements, with automatic reset.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION

SECTION 26 05 00
ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Provide all materials, labor, and equipment required to furnish and install a complete electrical system as indicated on the Drawings and as specified herein.
- B. Electrical work includes, but is not limited to, the following:
 - 1. Expand the distribution system for lighting and power including the necessary feeders, panelboards, branch circuits, conduit, lighting fixtures, control switches, and receptacles.
 - 2. Grounding.
 - 3. Telephone system raceways and boxes.
 - 4. Power wiring for equipment furnished under Division 21, 22 and 23.
 - 5. Data system raceways and boxes.
 - 6. Concrete foundations, curbs, pads, and bollards.
 - 7. Fire Alarm systems

1.2 RELATED WORK

- A. The following work shall be furnished under other Divisions of these Specifications, but shall be coordinated with said Divisions by Division 26 tradesman prior to bid.
 - 1. Flashing of conduits into roofing and outside walls.
 - 2. Painting.
 - 3. Cutting and patching.
 - 4. Heating, ventilating, air conditioning, and plumbing equipment.

1.3 DEFINITIONS

- A. Provide: Shall mean "furnish, install, connect, and put in good working order."
- B. Wiring: Shall mean "wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. completely installed."
- C. Engineer: Shall mean "Engineer of Record" whose seal is affixed to the contract specifications and drawings of Division 26.

1.4 CODES AND STANDARDS

- A. Comply with applicable local, state, and federal codes.
- B. Electrical work shall be installed in accordance with the Drawings and Specifications, the 2011 NEC, 2012 IBC, applicable accessibility code and NFPA.
- C. In event of conflict between Drawings, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling will then be made by the Engineer in writing. All work shall be installed in strict accordance with applicable codes without additional cost to Owner.
- D. Contractor shall submit and/or file all necessary specifications and drawings as required by governing authorities.

1.5 SUBMITTALS

- A. Provide submittals on materials and equipment identified in the Specifications and Drawings prior to manufacturer, order, or installation in accordance with Shop Drawings, Product Data, and Samples.
- B. Submittals shall include but not be limited to the following:
 - Lighting fixtures

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SITE VISIT

- A. Visit job site prior to bid date to determine actual conditions under which work shall be done, to become familiar with project, and to verify total scope of work required. Failure to do so shall not constitute a reason for an extra charge.

END OF SECTION

SECTION 26 05 01

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: All materials and equipment used in work of Division 26 shall be produced by manufacturers regularly engaged in manufacturer of similar items and with history of successful production acceptable to the Engineer. They shall be new and be UL listed and labeled or listed and labeled by other recognized testing laboratory where such label is available.
- B. Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this Section.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

- A. Reference in Specifications to any article, device, product, material, fixture, form and type of construction, by name, make, or catalog number shall be interpreted as established standard of quality and shall not be construed as limiting competition. Any article, device, product, material, fixture, form and type of construction which in the judgment of Engineer, expressed in writing, is equal to that specified, may be used.
- B. Substitution shall be approved by Engineer before purchase and/or installation. If unapproved materials are installed, work required to remove and replace unapproved items shall be done at the Contractor's expense.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Electrical drawings are diagrammatic and shall not be scaled for exact sizes or locations. They are not intended to disclose absolute or unconditional knowledge of actual field conditions.
- B. Equipment shall be installed according to manufacturer's recommendations.
- C. Protect work and materials from damage by weather, entrance of water, and dirt. Cap conduit during installation. Avoid damage to materials and equipment in place.
- D. Satisfactorily repair or remove and replace damaged work with new materials.
- E. Trenching and backfilling shall comply with Site Work of these Specifications and provide sheathing, shoring, dewatering and cleaning necessary to keep trenches and their grades in proper condition for work to be carried on. Trenches shall be excavated 6" below elevation of bottom of conduit. Backfill shall be per Site Grading and Filling.
- F. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available space in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring services shall be readily accessible.
- G. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.
 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, whether exposed or concealed.
 10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 11. Install access panels or doors where units are concealed behind finished surfaces.
 12. Insulate dissimilar metals so they are not installed in direct contact.
- H. Conduits which pass through floor slabs (except ground floor) shall be sealed with Fire Stop Sealant. Seal around conduits or other wiring materials passing through partitions, floors, and fire rated walls. Use UL approved Fire Stop Sealant as detailed on the drawings.
- I. Coordinate electrical power connection requirements with all equipment suppliers. Where power requirements differ from drawing design requirements, Engineer shall be notified for clarification and installation requirements prior to installing that portion of work. Cost for equipment and labor for improperly installed electrical connections not coordinated and approved by other trades and the Engineer shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of rework.

3.2 CUTTING AND PATCHING

- A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

3.3 TESTING AND EQUIPMENT SERVICING

- A. Entire installation shall be free from improper grounds and short or open circuits. Conductors shall be tested before energizing circuit. Test to insure that entire system is in proper operating condition, and that adjustments and settings of circuit breakers, fuses, control equipment, and apparatus have been made. Correct defects discovered during tests.

3.4 REMOVAL OF DEBRIS

- A. Remove surplus materials and debris caused by, or incidental to electrical work. Remove such debris at frequent intervals. Keep job site clean during construction.

3.5 IDENTIFICATION OF EQUIPMENT

- A. Equipment shall be identified in accordance with Section 260553, "Electrical Identification."

3.6 AS-BUILT DRAWINGS

- A. Maintain one set of blue line electrical prints on site, marked to show as-built conditions and installations, prints to be turned over to Owner after job is complete.

3.7 TEMPORARY LIGHTING AND POWER

- A. Not Required

3.8 POWER OUTAGES

- A. Coordinate all power outages with Owner and submit for approval proposed schedule of work indicating extent, number, and length of outages required to perform work. Contractor shall include in bid cost of overtime labor required for power outage to occur after Owner's normal hours of operation.

3.9 OTHER MATERIALS

- A. Work of this Division shall also include those items not specifically mentioned or described, but which are obviously necessary to conform to the design intent, applicable codes and to produce complete electrical system that functions properly. These materials shall be as selected by Contractor but subject to approval of the Engineer.

3.10 OTHER COORDINATION

- A. Contractor shall obtain and pay for all necessary permits and inspection fees required for the electrical installation.

3.11 GUARANTEE-WARRANTY

- A. Guarantee work to be free of material and workmanship defects for a period of one year, from date of final acceptance for the project. Repair and replace defective work and other work damaged thereby which becomes defective during term of Guarantee-Warranty. Furnish Owner with three written copies of Guarantee-Warranty.

END OF SECTION

SECTION 26 05 16

CONDUIT

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Provide a complete conduit system to support all electrical equipment and systems. Conduit system includes conduit, couplers, connectors, fittings, boxes, covers and supports.
- B. No conduit serving branch circuits shall be installed in or below concrete slabs unless required for branch circuits serving loads located in the center of a room.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide conduit that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Conduit and its installation shall comply with requirements of the National Electrical Code.

PART 2 PRODUCTS

2.1 CONDUIT

- A. Electric Metallic Tubing (EMT): Allied, Wheatland, LTV Copperweld.
- B. Rigid Metal Conduit (RMC): Allied, Wheatland, Republic.
- C. Flexible Steel Conduit (Greenfield): Alfex, Electroflex.
- D. Rigid Non-Metallic Conduit (PVC): Carlon Schedule 40, Cantex, Southern Pipe, Schedule 80.
- E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Aflex, Electroflex.

2.2 CONDUIT FITTINGS

- A. Couplings and connectors: Appleton, T&B, Arlington, or O.Z. Gedney.
- B. Bushings: Appleton, T&B, O.Z., or Gedney
- C. Straps and Hangers: Appleton, T&B, Steel City, or Minerallac.
- D. Group Pipe supports: Unistrut, Kindorf, B-Line.
- E. Expansion Fittings: O.Z. Gedney Type AX, or equal by Appleton.
- F. Exposed Conduit Fittings: Appleton, Crouse-Hinds, or O.Z. Gedney.

PART 3 EXECUTION

3.1 CONDUIT

- A. In general, conduit installation shall follow layout shown on drawings. However, this layout is diagrammatic only and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without cost to Owner. Offsets in conduits are not indicated and must be furnished as required.
- B. Conduit shall be installed in accordance with the National Electrical Code.
- C. Provide bushings on the open ends of conduit containing conductors. Insulated bushings shall be provided for conduits containing conductors #4 AWG or larger with an insulating ring an integral part of the bushing.
- D. Use EMT where Drawings call for conduit to be concealed in walls or above ceilings or when cast in concrete slabs not on grade. Do not use EMT exposed in wet locations, or in exterior applications.
- E. Use Schedule 40 PVC when installed underground. Use Schedule 80 PVC when exposed.
- F. When PVC conduit is used, turn up perpendicular to slab.

- G. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of water during concrete pouring and at other times during construction, prior to completion of conduit installation.
- H. Route all conduit at right angles or parallel to walls of building.
- I. Use proper sized tools for bending. Do not heat metal conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.
- J. Minimum conduit size 1/2" unless otherwise required.
- K. Leave one #10 AWG or equivalent nylon pull wire in empty conduits.
- L. Use short pieces, approximately five (5') feet of flexible conduit to connect motors and other devices subject to motion and vibration. Use liquid tight flexible conduit where outside or subject to water spray.

3.2 CONDUIT FITTINGS

- A. When EMT is installed concealed in walls or above ceilings use steel double set screw connectors. All connectors shall have throated insulating bushing.
- B. Support conduit vertically and horizontally by straps or hangers. Do not exceed intervals as described in the National Electrical Code.
- C. Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel cans.

END OF SECTION

SECTION 26 05 19
WIRE AND CABLE

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Wire and cable for all service, feeders, branch circuits, and instrument and control wiring rated 600 volts and below.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wire and cable and its installation shall comply with requirements of the National Electrical Code.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Wires and cables shall meet applicable requirements of the National Electrical Code and UL for the type of insulation, jacket, and conductor specified or indicated.
- B. All conductors shall be copper with 600 volt insulation unless otherwise indicated.
- C. Wire and cable shall be manufactured by Belden, General Cable, Essex, Encore, Rome Cable, Southwirel.
- D. Use solid copper type THHN/THWN for branch circuit wiring #10 AWG and smaller. No conductor for branch circuit wiring shall be smaller than #12 AWG.
- E. Use stranded copper, type THHN/THWN for feeder and power circuits #8 AWG and larger.
- F. Provide color coded wire and with a different color for each phase and neutral and ground as follows: 120/240 volt circuits - phases A, B,; black, red, and blue, respectively; neutral: white; ground: green. Approved color tape is acceptable for feeders.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Complete conduit system before pulling any wire or cable. Use cable lubricants recommended by cable manufacturer as necessary.
- B. Conductors shall be continuous from outlet to outlet or to branch circuit over-current devices. Make splices only in junction boxes. Splices shall not be made in panelboards. Control wiring shall be continuous between components and/or terminal boards.
- C. A minimum of eight (8") inches of slack conductor shall be left in every outlet or junction box. There should also be enough slack so three (3") inches extends outside the outlet or junction box.
- D. Make splices in conductors #10 AWG and smaller diameter with insulated, pressure-type connector. Use Scotchlok, or Ideal wire connectors.
- E. Make splices in conductors #8 AWG and larger diameter with solderless connectors and cover with insulation material equivalent to conductor insulation. Use Burndy compression connectors with crimpit cover, type CC.

3.2 TESTING

- A. After completion of the installation and splicing and prior to energizing the conductors, wire and cable shall be given continuity and insulation tests as herein specified.

- B. Test wiring to verify that no short circuits, open circuits, or accidental grounds exist. Continuity tests shall be conducted using a dc device with bell or buzzer.
- C. Perform megger tests on wiring #4 AWG and larger.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Equipment grounding conductors.
- B. Bonding.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide grounding and bonding materials that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Components and installation shall comply with the requirements of the National Electrical Code (NEC).
- C. Materials shall comply with UL 467, "Grounding and Bonding Equipment."

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers shall be Burndy or T&B.

2.2 CONNECTORS

- A. Exothermic welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- B. Pressure connectors shall be high-conductivity-plated units.
- C. Bolted clamps shall be heavy-duty units listed for the application.

2.3 WIRE AND CABLE

- A. All grounding conductors shall be copper.
- B. The grounding electrode conductor shall be stranded.
- C. Equipment grounding conductors shall have green insulation.
- D. Bare copper conductors shall conform to the following:
 - 1. Solid conductors: ASTM B-3
 - 2. Assembly of stranded conductors: ASTM B-8
 - 3. Tinned Conductors: ASTM B-33

2.4 MISCELLANEOUS CONDUCTORS

- A. Ground bus shall be bare annealed copper bars.
- B. Braided bonding jumpers shall be copper tape, braided number 30 gauge bare copper wire, and terminated with copper ferrules.
- C. Bonding strap conductor/connectors shall be soft copper, 0.05 inch thick and two (2") inches wide, unless otherwise noted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Grounding system shall be in accordance with Article 250 of the NEC except where the Drawings or Specifications exceed NEC requirements.
- B. Install code size green grounding conductors in all feeder and branch circuits. Bond conductors to chassis or fixed equipment.

- C. All grounding conductors shall be bonded to multi-terminal ground bus at panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.

3.2 CONNECTIONS

- A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 - 2. Make connections with clean bare metal at points of contact.
 - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
 - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. For compression-type connections, use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- E. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in each piece of flexible conduit, and screw to conduit system with lugs at both ends.

3.3 FIELD QUALITY CONTROL

- A. Perform continuity tests at all power receptacles to ensure the ground terminals are properly grounded to the facility ground network.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fasteners.

1.2 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the National Electrical Code.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, Slotted Metal Angle and U-Channel Systems shall be provided by Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Unistrut Diversified Products.
- B. Subject to compliance with requirements, Conduit Sealing Bushings shall be provided by Bridgeport Fittings, Inc., Cooper Industries, Inc., Killark Electric Mfg. Co., O-Z/Gedney, Raco, Inc., Spring City Electrical Mfg. Co., or Thomas & Betts Corp.

2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be aluminum or hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Raceways shall be supported with clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
 - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.
 - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.4 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. over 6-inch: 14-gauge.
 - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 - 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
 - 1. Conform to manufacturer's recommendations for selection and installation of supports.
 - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs., provide additional strength until there is a minimum of 200 lbs. safety allowance in the strength of each support.
 - 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 - 6. Space supports for raceway types not covered by the above in accordance with NEC.
 - 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 - 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with manufacturer's recommendations.

- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 - 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 - 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION

SECTION 26 05 33
OUTLET AND JUNCTION BOXES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide outlet and junction boxes that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Outlet and junction boxes and their installation shall comply with the requirements of the National Electrical Code.

PART 2 PRODUCTS

2.1 OUTLET AND JUNCTION BOXES

- A. Outlet and junction boxes shall be galvanized steel, 1-1/2" deep minimum by Raco, T&B/Steel City, or Crouse Hinds.
- B. Boxes for interior areas with exposed conduit shall be pressed steel and in exterior areas with exposed conduit shall be cast metal with threaded hubs, "FS" type. Use galvanized steel for concealed boxes.

PART 3 EXECUTION

3.1 GENERAL

- A. Outlet and junction boxes in inaccessible ceiling areas shall be located no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- B. Install boxes to preserve fire resistance rating of partitions and other elements, using UL listed fire stop materials and methods.
- C. Do not install flush mounted boxes back-to-back in walls; provide minimum six (6") inches separation. Provide minimum twenty-four (24") inches separation in fire rated walls.
- D. Do not fasten boxes to ceiling support wires.
- E. Support boxes independently of conduit.
- F. Bonding jumpers shall be used around knockouts.

3.2 OUTLET BOXES

- A. Outlet boxes shall be securely anchored, set true, and plumb and no part of box shall extend beyond finished wall or ceiling. Flush mounted boxes shall be set to within 1/8" of finished wall and a plaster ring used to make cover flush with wall.
- B. Select boxes according to intended use and type of outlet. Ceiling outlet boxes shall be four (4") inches octagon and 2-1/2" deep. Use four (4") inches square boxes where required. All ceiling outlet boxes shall have a fixture stud of the no bolt, self-locking type if required to hang the fixture specified at the outlet.

- C. Receptacle and switch boxes installed in concrete block walls not plastered shall be Steel City, Appleton, Raco Series No. 690 through No. 699, or approved equal masonry boxes of proper depth and gang required and specifically designed for this purpose. If more than two conduits enter box from one direction, 4" square boxes with square-cut device covers not less than one (1") inch deep specifically designed for this purpose, shall be used. Round edge plaster rings will not be acceptable for block walls. Sectional or gangable type outlet boxes will not be acceptable except in drywall construction.
- D. Mount outlet boxes worked to nearest block course. Confirm ADA compliance.
- E. Install blank device plates on outlet boxes left for future use.
- F. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Confirm accessibility code compliance.

3.3 JUNCTION BOXES

- A. Pull and junction boxes shall be sized in accordance with the National Electrical Code according to number of conductors in box or type of service to be provided. Minimum size is 4-11/16" square and 2-1/2" deep.
- B. Pull boxes shall be provided where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with bends exceeding 270 degrees shall have a pull box installed at a convenient intermediate location.
- C. Install in locations as shown on Drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- D. Install pull and junction boxes above accessible ceilings and in unfinished areas only.

3.4 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Extent and types of electrical identification are indicated herein and as follows:
 - 1. Operational instructions and warnings.
 - 2. Danger signs.
 - 3. Equipment/system identification signs.
 - 4. Conduit identification.
 - 5. Power and control wiring identification.
 - 6. Terminal marking.
 - 7. Arc-flash warning.
 - 8. Panelboard Legends.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, identification products shall be provided by W.H. Brady Co., Ideal Industries, Inc., Panduit, or T&B.

2.2 MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Cable/Conductor Identification Bands: Provide manufacturer's standard wrap-around type, vinyl-cloth, self-adhesive cable/conductor markers with either pre-numbered plastic coated type or write-on type with clear plastic self-adhesive cover flap, numbered to show circuit identification. Provide markers for all field control wiring.
- C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings. Signs shall be of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN or DANGER – HIGH VOLTAGE).
 - 1. Colors: Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- D. Engraved Plastic-Laminate Signs: Provide three-layer engraving stock in sizes and thickness indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 - 1. Thickness: 1/16", for units up to 20 sq. in. or eight (8") length; 1/8" for larger units.
 - 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- E. Underground Warning Tape: Provide four (4") inch wide detectable type, plastic, yellow warning tape with suitable warning describing type of cable/circuit over buried electrical lines.

2.3 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations, and other designations used in electrical identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering, and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 EXECUTION

3.1 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Coordination: Where identification is to be applied to surfaces, which require finish, install identification after completion of painting.
2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
3. Conduit Identification: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange as coded color for conduit.
4. Equipment/System Identifications: Install engraved plastic-laminate sign on each disconnect and control cabinets. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide identification and warning signs for each unit of the following categories of electrical work.
 - a. Electrical cabinets and enclosures.
 - b. Panelboards
 - c. Disconnect switches.

END OF SECTION

SECTION 26 05 73
OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section includes circuit breakers and fuses.

1.2 SUBMITTALS

- A. Provide manufacturer's product data for the following:
 - 1. Circuit breakers
 - 2. Enclosures
 - 3. Fuses (Provide complete list of all fuses and the equipment where they are used.)
- B. Provide maintenance data for products for inclusion in the Operating and Maintenance Manual.
 - 1. Include a load current and overload relay heater list compiled by Contractor after motors have been installed. Arrange list to demonstrate selection of heaters to suit actual motor nameplate full load currents.

1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide overcurrent protective devices that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Overcurrent protective devices and their installation shall comply with the requirements of the 2008 National Electrical Code.
- C. Circuit breakers shall comply with UL 489, NEMA AB 1, and NEMA AB 3.
- D. Fuses shall conform to NEMA FU 1.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Circuit Breakers: Subject to compliance with requirements, provide products by Cutler-Hammer; General Electric Co.; Siemens Energy & Automation, Inc.; or Square D Co.
- B. Fuses: Subject to compliance with requirements, provide products by Bussmann Mfg. Co., Littlefuse Co, or Ferraz Shawmut.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case, manually operated, trip-free, with inverse-time, thermal-overload protection, and instantaneous magnetic, short-circuit protection, as required. Circuit breakers shall be completely enclosed in a molded case, with the calibrated sensing element factory-sealed to prevent tampering.
- B. Thermal-magnetic tripping elements shall be located in each pole of the circuit breaker and shall provide inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection.
- C. Breaker size shall be as required for the continuous current rating of the circuit. Breaker class shall be as required.
- D. Interrupting capacity of the branch circuit breakers shall be sufficient to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Circuit breaker minimum interrupting capacities shall be as shown on drawings and shall conform to NEMA AB 3.

- E. Multipole circuit breakers shall be of the common-trip type having a single operating handle and shall have a two-position on/off indication. Circuit breakers shall have temperature compensation for operation in an ambient temperature of 104 degrees F. Circuit breakers shall have root mean square (rms) symmetrical interrupting rating sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).
- F. Breaker body shall be of phenolic composition. Breakers shall be capable of having such accessories as handle-extension, handle-locking, and padlocking devices attached where required.
- G. Provide UL listed service entrance equipment when used for service disconnect.
- H. Circuit breakers used for switching high intensity discharge lights or fluorescent lights shall be rated for that type of service.

2.3 ENCLOSED MOLDED-CASE CIRCUIT BREAKERS

- A. Enclosed circuit breakers shall be thermal-magnetic, molded-case circuit breakers in surface-mounted, nonventilated enclosures, conforming to the appropriate articles of NEMA 250 and NEMA AB 1.

2.4 FUSES

- A. A complete set of fuses for all switches shall be provided. Fuses shall have a voltage rating not less than the circuit voltage.
- B. Provide Class RK5 fuses for motor branch circuits.
- C. Fuses shall be labeled showing UL class, interrupting rating, and time-delay characteristics, when applicable.
- D. Fuse holders field-mounted in a cabinet or box shall be porcelain. Field installation of fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber shall not be used.
- E. Provide a minimum of three (3) spare fuses of each size and type fuse installed.
- F. Provide a complete list of all fuses and the equipment where they are used.

2.5 EQUIPMENT ENCLOSURES

- A. Enclosures for equipment shall be in accordance with NEMA 250.
- B. Equipment installed inside, clean, dry locations shall be contained in NEMA Type 1, general-purpose sheet-steel enclosures.
- C. Equipment installed in wet locations shall be contained in NEMA Type 3R, rainproof, sheet-steel enclosures, constructed for outdoor use to protect against falling rain, sleet, and ice.
- D. Ferrous-metal surfaces of electrical enclosures shall be cleaned, phosphatized, and painted with the manufacturer's standard finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices.
- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.
- D. Install enclosed circuit breakers plumb with operating handle at five (5') feet above finished elevation.

3.02 ADJUSTING

- A. Inspect circuit breaker operating mechanisms for malfunctioning and adjust units for free mechanical movement.

3.03 FIELD QUALITY CONTROL

- A. Prior to energizing overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.
- B. In the presence of the Owner or Owner's Representative, test each device and demonstrate its working as specified.

END OF SECTION

SECTION 26 24 00
MECHANICAL EQUIPMENT AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. General provisions of contract, including general and supplementary conditions and general requirements apply to work specified in this section.

PART 2 PRODUCTS

2.1 STARTERS

- A. All starters for Division 22 and 23 package mechanical equipment will be furnished by Division 22 and 23, but installed and connected by Division 26

2.2 CONTROL WIRING

- A. All control wiring for mechanical equipment shall be provided in conduit under each respective division. Control components for mechanical equipment will be furnished and installed by Division 22 and 23.

2.3 POWER WIRING

- A. All power wiring at 120 and 240 volts shall be provided by Division 26.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Coordinate electrical power connection requirements with Mechanical Contractor. Where power requirements differ from drawing design requirements, Engineer shall be notified in writing. Contractor shall be given clarification and installation requirements prior to installation of the portion of work. Cost of equipment and labor for improperly installed electrical connections not coordinated and approved by Engineer and Mechanical Contractor shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of any rework.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.1 SCOPE

- A. The Contractor shall furnish and install the panelboards as specified and as shown on the contract drawings.

1.2 REFERENCES

- A. The panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL as follows:
 - 1. UL 67 – Panelboards
 - 2. UL 50 – Cabinets and boxes
 - 3. NEMA PB1
 - 4. Fed. Spec. W-P-115C
 - 5. Circuit breaker – Type I class I
 - 6. Fusible switch – Type II class I

1.3 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Breaker layout drawing with dimensions indicated and nameplate designation
 - 2. Component list
 - 3. Conduit entry/exit locations
 - 4. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - 5. Cable terminal sizes
 - 6. Product data sheets
- B. Where applicable, the following additional information shall be submitted to the Engineer:
 - 1. Key interlock scheme drawing and sequence of operations

1.4 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
 - 2. Installation information

1.5 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The panelboards shall be UL labeled.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Eaton, Square-D, General Electric, and Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Other manufacturers will be considered, provided their products meet the requirements of the documents.

2.2 RATINGS

- A. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes RMS symmetrical.
- B. If applicable, panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 14,000 amperes RMS symmetrical.
- C. Panelboards shall be labeled with a UL short-circuit rating. When series ratings are applied with integral or remote upstream devices, a label or manual shall be provided. It shall state the conditions of the UL series ratings including:
 - 1. Size and type of upstream device
 - 2. Branch devices that can be used
 - 3. UL series short-circuit rating

2.3 CONSTRUCTION

- A. Interiors shall be completely factory assembled. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
- B. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Door-in-door trim shall be provided. Both hinged trim and trim door shall utilize three point latching. No tools shall be required to install or remove trim. Trim shall be equipped with a door-actuated trim locking tab. Equip locking tab with provision for a screw such that removal of trim requires a tool, at the owner's option. Installation shall be tamper resistant with no exposed hardware on the panelboard trim.
- C. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
- D. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
- E. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
- F. All locks shall be keyed alike.

2.4 BUS

- A. Main bus bars shall be copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.

- B. A system ground bus shall be included in all panels.
- C. Full-size (100%-rated) insulated neutral bars shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

2.5 BRANCH CIRCUIT PANELBOARDS

- A. The minimum short-circuit rating for branch circuit panelboards shall be as specified herein or as indicated on the drawings. Panelboards shall be series rated. Panelboards shall be Eaton type Pow-R-Line 1a, Pow-R-Line 2a or Pow-R-Line 3a.
- B. Bolt-on type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.
- C. Circuit breakers shall be thermal-magnetic type with common type handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame and through 100-ampere trip sizes shall take up the same pole spacing. Circuit breakers shall be UL listed as type SWD for lighting circuits.
 - 1. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.
- D. Circuit breakers shall have a minimum interrupting rating of 10,000 amperes symmetrical at 240 volts, and 14,000 amperes symmetrical at 480 volts, unless otherwise noted on the drawings.

2.6 DISTRIBUTION PANELBOARDS – CIRCUIT BREAKER TYPE

- A. Distribution panelboards with bolt-on devices contained therein shall have interrupting ratings as specified herein or indicated on the drawings. Panelboards shall be series rated. Panelboards shall be Eaton type Pow-R-Line 3a or Pow-R-Line 4B. Panelboards shall have molded case circuit breakers as indicated below.
- B. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
- C. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.7 ENCLOSURE

- A. Enclosures shall be at least 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electrical Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
- B. Enclosures shall be provided with blank ends.
- C. Where indicated on the drawings, branch circuit panelboards shall be column width type.

2.8 NAMEPLATES

- A. Provide an engraved nameplate for each panel section.

2.9 FINISH

- A. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

PART 3 EXECUTION

3.1 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.2 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES AND PLATES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Switches
- B. Receptacles
- C. Plates

1.2 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wiring devices and plates that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wiring devices and plates and their installation shall comply with the requirements of the National Electrical Code.

PART 2 PRODUCTS

2.1 SWITCHES

- A. Switches shall be toggle, quiet-type with totally enclosed with bodies of thermoplastic and mounting strap. Color shall be selected by architect.
- B. Switches shall be rated for 20 amps, 277 volts AC. Switches shall be specification grade Hubbell, P&S, Leviton, or Cooper Wiring Devices.

2.2 RECEPTACLES

- A. Receptacles shall be general purpose, heavy duty, duplex receptacles with bodies made of thermoplastic supported on a metal mounting strap in accordance with NEMA WD 1. Receptacles shall be 20 amp, 125 volt, specification grade Cooper Wiring Devices, Hubbell, Leviton, P&S. Color shall be selected by architect.
- B. Ground fault circuit interrupter receptacles shall be the "feed-through" type rated to protect 20 amps. Receptacles shall be specification grade duplex receptacles with an impact-resistant nylon face with test and reset buttons. Color shall be selected by architect.
 - 1. 20 Amp, 125 Volt: Cooper Wiring Devices, Hubbell, Leviton, or P&S.
- C. Special Receptacles: As indicated on Drawings.

2.3 PLATES

- A. Provide UL listed, one-piece device plates to suit the devices installed.
- B. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast-metal having round or beveled edges.
- C. Plates on finished walls shall be nylon, mid-size.
- D. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine-type with countersunk heads in color to match finish of plate.
- E. Plates installed in wet locations shall be gasketed and UL listed for "wet locations" as per NEC 406.8 (B).
- F. Modular plates for data, cable television, and telephone by others.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide proper size outlet boxes for all wiring devices in accordance with Section 260533, "Outlet and Junction Boxes."
- B. Install switches forty-eight (48") inches above finished floor on lock side and clear of door frame a minimum of three (3") inches unless otherwise noted. Prior to rough-in, coordinate with architectural

drawings to determine lockside of door.

- C. All switches shall be made by the same manufacturer.
- D. Where two or more snap switches are to be installed at the same location, they shall be mounted in one-piece ganged switch boxes, with at gang cover plate.
- E. Combination snap switch and single or duplex receptacles shall be mounted in two-gang switch box with one-piece device plate.
- F. Receptacles shall be mounted 18" above finished floor unless otherwise noted.
- G. All wiring devices shall be mounted in accordance with accessibility code requirements.
- H. The finish of devices and coverplates shall be selected by the architect.

END OF SECTION

SECTION 26 28 13 - DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Fused Disconnect Switches

1.02 SUBMITTALS

- A. Provide product data showing switch's ratings and enclosure type.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide disconnect switches that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Disconnect switches and their installation shall comply with the requirements of the National Electrical Code.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Switches shall be Eaton, or approved equal. Examples are Square D, General Electric, Siemens Energy & Automation.

2.02 MATERIALS

- A. Use heavy-duty type for 600 volt switches. Switches shall have quick make, quick break, load interrupter, enclosed knife switch manufactured to the requirements of NEMA KS 1.
- B. All switches shall have externally operable handles with interlocking covers to prevent opening front cover with switch in the ON position and have provisions for multiple padlocks in the OFF position.
- C. Provide equipment ground lug in each switch.
- D. Provide NEMA 1 enclosures for interior installations, unless otherwise noted.
- E. Provide NEMA 3R enclosures for exterior installations or in wet locations, unless otherwise noted.
- F. Provide fuses as per equipment manufacturer recommendation, dual-element, time-delay, current limiting, with blown fuse indicator site glass.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide safety switches sized as indicated on the Drawings.
- B. Mount individually enclosed switches plumb and level with top four (4') feet above floor or grade, unless otherwise noted.
- C. Provide a set of fuses in fusible disconnect switches, as per equipment manufacturer recommendations.

3.02 IDENTIFICATION

- A. Identify disconnect switches in accordance with Section 26 05 53, "Electrical Identification."

END OF SECTION

SECTION 26 61 00
GENERAL LIGHTING PROVISIONS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Fixtures
- B. Controls
- C. Lamps
- D. Ballasts/Drivers
- E. Exterior Fixtures
- F. Emergency Lighting

1.2 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 260500.
- B. Submit shop drawings for luminaries showing pertinent physical characteristics and performance data.
- C. Submit samples of luminaries prior to final production at Engineer's request on any proposed fixture substitution.
- D. Provide a complete set of fixture information and include in O&M Manuals.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide fixtures as shown in the fixture schedule.

2.2 FIXTURES

All LED fixtures shall have the following characteristics:

- A. Minimum color rendering index (CRI) of 80
- B. L70 of 50,000 or greater with minimum 5 year warranty to support lifetime claim
- C. Passive cooling only for LED fixtures with less than 2000 lumens
- D. Color Temperature within 4 SDCM or less (Standard Deviation Color Matching aka MacAdam Ellipse)
- E. Remote Phosphor LEDs only where consistency of color over the life of the LED is critical
- F. Driver lifetime of 50,000 hours or more, with minimum 5 year warranty to support lifetime claim
- G. All light engines and drivers must be field-replaceable
- H. Driver information must be available including brand, dimming options, and amperage rating

2.3 CONTROLS

- A. Time switches shall be Tork, Intermatic, or Paragon of types and quantity shown on Drawings.

2.4 EMERGENCY EGRESS LIGHTING UNITS AND EXIT SIGNS

- A. Provide fully automatic operation on power failure. Units shall have integral battery back-up for 1½ hours per NFPA. Units shall be connected unswitched to lighting circuits.

PART 3 EXECUTION

3.1 GENERAL

- A. Furnish, locate, and install fixtures as indicated on Drawings.

3.2 INSTALLATION

- A. Mount fixtures as called for in schedule on Drawings. Determine type of ceiling to be installed in each space and furnish fixtures suitable for exact type, including roof/floor or ceiling/floor fire rated design. Recessed fixtures shall be supported from building structure.

- B. Lighting fixtures shall be structurally supported. Fluorescent fixtures mounted in the ceiling shall be attached to ceiling system as required by NEC 410-16(b). Surface mounted fixtures shall be supported from building structural system by rods or rods and clamps, or by fixture outlet box which in turn shall be supported by rods.
- C. Receive, store, uncrate, and install light fixtures shown in schedule on drawings to be specified by others.
- D. Adjust lighting fixtures to illuminate the intended area.
- E. Wire recessed fluorescent luminaries with Type THHN wire not smaller than No. 12.
- F. Wire surface mounted fluorescent luminaries with Type THHN wire not smaller than No. 12 from outlet boxes.
- G. Locate no splice or tap within an arm or stem. Wire shall be continuous from splice in outlet box of building wiring system to lamp socket or ballast terminals.

END OF SECTION

**SECTION 31 00 00
EARTHWORK**

PART 1 - GENERAL

1.1 SCOPE

- A. Related work specified elsewhere including:
1. Section 31 11 00 – Clearing and Grubbing

1.2 SUMMARY:

- A. This Section includes the following:

1. Preparing of subgrade for building slabs, walks, pavements, sports fields, and lawn areas.
 - a. Work for this project shall comply with the written recommendations of the geotechnical report to be provided by the Owner.
 - 1) The work of this Section shall include complete removal of existing utilities indicated to be removed (including bedding & backfill) and any existing footings, grade slabs, foundation walls, basement walls and backfill, septic systems (including drain fields), debris from any previously existing building(s) and improvements which occur within the “controlled areas”.
 - 2) Stripping of all vegetation, topsoil, and other deleterious materials shall extend at least the limits of disturbance. Stockpile stripped topsoil for landscaping purposes.
 - 3) After initial site preparation is complete, stockpile excavated topsoil and utilize to build and/or cap athletic fields and landscape areas.
 - 4) When excavation has reached required subgrade elevations, notify geotechnical engineer, who will inspect conditions. If geotechnical engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Geotechnical Engineer. Removal and replacement of unsuitable materials beyond depths specified, as directed by the Geotechnical Engineer, shall be paid for at unit price established in the Owner-Contractor Agreement.
 - 5) Fill Material under building shall be as directed herein.
 - b. Refer also to Civil and Structural Drawings for additional information and requirements.
 - c. “Building Controlled Areas” and other “Controlled Areas” include building footprint, areas below roofs, canopies and covered porches, and 5 feet beyond.
- B. Placement and compaction of at least 12-inches of topsoil up to finish grades is included in the work of Backfilling and Finished Grading.

1.3 DEFINITIONS:

- A. "Excavation" consists of removal of materials and existing improvements encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. "Unauthorized" excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be at Contractor's expense.
 - 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Owner's Representative.
 - 2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Representative.
- C. "Additional Excavation": When excavation has reached required subgrade elevations, notify geotechnical engineer, who will inspect conditions. If geotechnical engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by geotechnical engineer.
- D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, drainage fill, or topsoil materials.
- E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.
- F. "Building Control Area" and/or "Controlled Area": Below and 5-feet beyond building footprint or exterior walls, and below roofs, to include covered porches and canopies, and below and 5-feet beyond all walks and pavements.
- G. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1/2 cu. yd. for bulk excavation, footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1.4 SUBMITTALS:

- A. Test results shall be reported in writing to Owner's Representative, Architect, Structural Engineer, Civil Engineer, and Contractor on same day tests are made.
 - 1. Test reports on fill and borrow material; on-site as well as off-site materials.
 - 2. Verification of suitability of each foundation, floor slab and subgrade condition and material, in accordance with specified requirements.
 - 3. Field reports; and in-place soil density tests.

1.5 QUALITY ASSURANCE:

- A. Codes and Standards: Perform excavation work on site and in right-of-ways in compliance with applicable requirements of authorities having jurisdiction.

- B. Testing and Inspection Service: All required soil testing and inspection services during earthwork operations shall be performed by a qualified independent geotechnical testing laboratory obtained by the owner.

1.6 PROJECT CONDITIONS:

- A. Site Information: Section "Clearing and Grubbing", and Civil Drawings, for additional information and recommendations.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations in the vicinity, and as may also be required for other construction work.
 - 1. Notify the Tennessee "One Call" service (811) at least 3-full working days (72 hours), excluding weekends and holidays, prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.
 - a. Notify non-member companies directly, for them to perform this service.
 - 2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Owner's Representative and then only after acceptable temporary utility services have been provided.
 - a. Provide minimum of 48-hour notice to Owner and copy Owner's Representative, and receive written notice to proceed before interrupting any utility.
 - 4. Demolish and completely remove from the site any existing underground utilities indicated to be removed, and all existing underground utilities in "controlled areas". Coordinate with utility companies for shutoff of services if lines are active.
- C. Use of Explosives: Use of explosives shall be per local and state codes and ordinances.
- D. Protection of Persons and Property:
 - 1. Barricade open excavations occurring as part of this work and post with warning lights.
 - 2. Operate warning lights as recommended by authorities having jurisdiction.
 - 3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.
 - 4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

1.7 Soil Classification:

- A. Material to be excavated is Unclassified to the depths specified. Remove material whether earth or rock at no additional cost to the owner.

- B. When excavation has reached required subgrade elevations, notify geotechnical engineer, who will inspect conditions. If geotechnical engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Geotechnical Engineer. Removal and replacement of unsuitable materials shall be paid for at unit price in the contract documents.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS - DEFINITIONS:

- A. Satisfactory soil materials are defined as clean, non-saturated, non-organic sections of earth taken from on-site cuts (if allowed), and having a maximum particle size of 3 inches, a maximum dry density greater than 100 pounds per cubic foot, and a Liquid Limit less than 50 and Plasticity Index (PI) less than 25. See the recommendations of the Report of Geotechnical Study.
 - 1. Note: On-site soils are anticipated to be used as structural fill in building or any controlled areas after tested and found acceptable to the Project Geotechnical Engineer.
- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups other than those indicated above.
- C. Backfill and Fill Materials (Grassed areas only; Cuts and fills outside “controlled areas”, during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
 - 1. All fill soils must be compatible with existing soils, so they can bond together.
- D. Offsite Borrow Material
 - 1. All fill soils including rock must be approved by the Geotechnical Engineer.
- E. Fill Material under Building
 - 1. Rock fill approved for use on site should consist of a densely graded mixture of rock fragments ranging in particle size from 18 inches in maximum dimension down to 1 inch, and containing less than 10% soil size particles by weight. The rock fill is to be placed in horizontal lifts not more than 24 inches thick and subsequently compacted to produce a stable, unyielding mass with essentially no voids. Compaction of the rock fill should be performed with a heavy (20 ton) vibratory roller. The compaction of the fill must be visually monitored by the geotechnical engineer, or his representative, and should entail at least 7 complete passes with the compaction equipment over each lift of fill.
 - 2. In order to facilitate excavations associated with foundations and/or utilities, the upper 2 feet of the fill pad can consist of surge-stone. Surge-stone consists of smaller sized rock (maximum 6 to 8 inch particles). The surge-rock should be placed in maximum 12 inch lifts and compacted similarly as that discussed above for shot-rock fill.

PART 3 - EXECUTION

3.1 PROOFROLLING:

A. Areas throughout significant slopes and beneath and 5'-0" beyond new building and covered areas, and beneath and 5-0" beyond any new walk and pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a partially loaded truck with a rear single axle weight of 8 to 10 tons, or similarly weighted construction equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the "controlled areas". Soft, organic, or excessively wet soils found during the proofrolling operations shall be excavated and replaced with suitable compacted fill. The exposed subgrade must be well drained to prevent the accumulation of water.

1. Proofrolling shall be conducted in the presence of testing lab's Geotechnical Engineer.
2. Do not proofroll when the ground surface is wet or saturated with water.

3.2 EXCAVATION:

A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.

3.3 STABILITY OF EXCAVATIONS:

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 DEWATERING:

- A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.5 STORAGE OF EXCAVATED MATERIALS:

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Install erosion control measures as necessary to prevent siltation onto adjacent properties or onto the project area.
 - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 - 2. Dispose of clean excess excavated soil material by spreading at on-site location as directed by Owner. Remove and legally dispose off site, materials not wanted by the Owner and/or not acceptable for use as backfill or fill.

3.6 EXCAVATION FOR STRUCTURES:

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS:

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.8 TRENCH EXCAVATION FOR PIPES AND CONDUIT:

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6-inches to 9-inches of clearance on both sides of pipe or conduit.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on minimum of 4-inches of compacted "select fill" bedding. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage, etc.) so top of piping is not less than 2'-6" below finished grade and/or paving.
- D. Unless specifically indicated otherwise, where rock or concrete is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel, prior to installation of pipe.

3.9 COLD WEATHER PROTECTION:

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.10 BACKFILL AND FILL:

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
 - 1. Under all areas, use satisfactory excavated or borrow material. Refer to Report of Geotechnical Study, and this Section for minimum testing requirements.
 - 2. Under building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, at least 4-inches compacted and completed thickness.

- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.
 2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.
 3. Removal of concrete formwork, if any.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
 5. Removal of trash and debris from excavation.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

3.11 PLACEMENT AND COMPACTION:

- A. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1-vertical to 4-horizontal so that fill material will bond with existing surface.
 2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- B. Place backfill and fill materials in layers not more than 8-inches in loose depth for material compacted by heavy compaction equipment, and not more than 4-inches in loose depth for material compacted by hand-operated tampers.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Owner's Representative if soil density tests indicate inadequate compaction.
1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698 A:
 - a. Under structures, building slabs and steps, sidewalks, pads, and in all "controlled areas", and 5-feet beyond, compact at least the top 12-inches of subgrade at 98-percent maximum density, and each layer of backfill or fill material at 98-percent maximum density. Compact the top 12-inches of the exposed subgrade in both cut and fill areas to at least 95-percent maximum density.

- b. Under pavements and 5-feet beyond (measured from back-of-curb or edge of paving, where occurs), process and compact the top 12-inches of subgrade at 95-percent maximum density, and each layer of backfill or fill material at 98-percent maximum density; Refer to Civil and Structural Drawings for additional information and requirements.
 - 1) Modified roadbed, and crushed stone or other base material indicated below any vehicular concrete pavement: 100-percent S.P.D. Refer to Division 2 Section "Portland Cement Concrete Paving" for additional information and requirements.
 - c. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material at 85-percent maximum density.
 - d. On-site Borrow (where allowed): 98-percent standard density.
 - e. Select and/or Structural Fill: 98-percent standard density.
 - f. Porous Fill (drainage course): 98-percent standard density.
2. Moisture Control:
- a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
 - b. Remove and replace, or scarify and moisture condition, soil material that is too wet to permit compaction to specified density.
 - c. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist moisture conditioning by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
 - d. At the time of placement and densification, the moisture content of "engineered fill", "structural fill", "select fill", and "retaining wall backfill" shall be within 3% of the materials' ASTM D-698 optimum moisture content for native clay, "select fill", "structural fill", and "retaining wall backfill".
 - e. Structural fill areas exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density should be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.
 - f. In no instance should placement of structural fill or ground supported structures be permitted if the ground surface soils contain a moisture content in excess of 3% of the material's optimum moisture content.
 - g. In no case shall porous drainage backfill (except as specifically indicated at foundation drains only) or masonry sand material be used adjacent to foundations or utility trenches. Care shall be taken to prevent masonry brick/block debris from falling or being pushed into foundation and/or trench excavations.

3.12 GRADING:

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
 - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above-or-below required subgrade elevations.
 - 2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above-or-below required subgrade elevation.
 - 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.
 - 4. Connection of Existing and New Work: Provide flush transition, unless specifically indicated otherwise.
- C. Grading Surface of Fill under Building Slabs and "Building Control Areas": Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.13 BUILDING SLAB DRAINAGE COURSE:

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs, sidewalks, pads, and below canopies and covered porches, and elsewhere as indicated.
 - 1. Minimum Completed Thickness: 4-inches.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
 - 1. When a compacted drainage course is indicated to be 6-inches thick or less, place material in a single layer. When indicated to be more than 6-inches thick, place material in equal layers, except no single layer more than 6-inches or less than 3-inches in thickness when compacted.

3.14 FIELD QUALITY CONTROL:

- A. Quality Control Testing During Construction:
 - 1. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
 - 2. Perform field density tests in accordance with ASTM D 698 (sand cone method), or acceptable nuclear testing method, as applicable.

3.15 EROSION CONTROL:

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction in accordance with the Stormwater Pollution Prevention Plan and the Erosion Control plans.

3.16 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Repair edges of existing pavements, sidewalks, etc., and other existing and/or new improvements flush with and to match existing materials and thicknesses, subject to acceptance by Owner and Owner's Representative.
- D. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- E. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove unacceptable soils materials, waste materials, trash, and debris, and legally dispose of off Owner's property.
 - 1. Clean excess soil material without any construction debris, trash, tree roots over 1-inch in diameter, stumps, etc., shall be neatly spread and graded on site, as directed by the Owner's Representative and Owner.

END OF SECTION

**SECTION 31 10 00
SITE CLEARING**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Protecting existing trees and vegetation to remain.
 2. Removing trees and other vegetation.
 3. Clearing and grubbing.
 4. Topsoil stripping.
 5. Removing above-grade site improvements.
- B. Related Sections include the following:
1. Section 01 50 00 - "Facilities and Controls".
 2. Section 02 22 10 - "Building Demolition"

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become the Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

- A. Record drawings according to Division 1 Section "Contract Closeout."
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 3. Maintain designated site access for vehicular and pedestrian traffic.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the Owner's premises

where indicated.

- C. Notify the utility locator service for the area where the Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 02300 Section "Earth Work."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available onsite.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation, utilities, and features designated to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.3 UTILITIES

- A. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's Representative's written permission.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation, unless noted otherwise on Drawings. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Remove trees, shrubs, and other vegetation as indicated on Drawings unless otherwise noted to be saved/protected or relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct work.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Burning of debris on site shall not be permitted.
- C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil,
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil, Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil and allow for re-spreading deeper topsoil,

3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

**SECTION 31 22 00
SITE EXCAVATION**

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Excavating and grading for:
 - 1. Building pads – Refer to Structural Specifications
 - 2. Embankment areas.
 - 3. Waterways and ditches (including inlet structures and outlet ditches, channels, waterways, etc.)
- B. Excavating of unsuitable material from beneath structured areas and fill embankment areas.

1.2 RELATED WORK

- A. Section 01 45 33: Testing Laboratory Services
- B. Section 31 00 00: Earthwork
- C. Section 31 23 00: Backfilling and Finish Grading
- D. Section 33 05 00: Excavating and Backfilling for Service Utilities
- E. Section 33 40 00: Storm Drainage Systems

1.3 QUALITY ASSURANCE

- A. Testing Laboratory and Soils Engineer:
 - 1. The Soils Engineer and Testing Laboratory's fees will be paid by the Owner except when the Soils Engineer or Testing Laboratory personnel are notified by the Contractor that work will be in progress, and they (Soils Engineer or Laboratory personnel) come to job site and work is not in progress. In that case, the Contractor shall pay for Soils Engineer's or laboratory personnel's time and mileage. Contractor shall pay for retesting as required. Have earth borrow fill and structural fill tested and approved by designated testing laboratory before moving it to the job site.
 - 2. Areas where building and paved areas will be located shall be proof-rolled to determine adequacy of soils compaction. Other areas will be inspected by Soils Engineer to determine adequacy in other areas.
 - 3. Soils compaction testing of in-place soil, and filling compacted areas will be performed by Testing Laboratory in accordance with their requirements.

1.4 EXISTING CONDITIONS

- A. Known underground, surface and aerial utility lines, and buried objects are indicated on the Drawings. Contractor shall verify exact locations.
- B. Do not interrupt existing utilities service to facilities occupied and used by the Owner or others, except when permitted in writing, by Owner's Representative and then only after temporary utility services have been provided.

1.5 PROTECTION

- A. Protect trees, shrubs and lawns, rock outcroppings and other features remaining as part of final landscaping.
- B. Protect benchmarks, existing structures, fences, roads, sidewalks, paving, curbs and adjacent properties against damage from equipment and vehicular traffic.
- C. Protect aerial, surface, or underground utility lines and appurtenances which are to remain.
- D. Repair damage made to any of the above.
- E. Erosion control must be maintained. Refer to notes on Erosion Control Sheets.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas. Keep excavations free of water during the entire progress of the work, regardless of the case, source, or nature of the water.
- B. Trees shall be left undisturbed that are outside the limits of disturbance.

1.7 SEDIMENT AND EROSION CONTROL

- A. Protect newly graded areas from erosion. Where necessary, temporarily seed disturbed areas with annual rye grass at a rate of 4 lbs/1000 sq. ft. If seeding is necessary in summer months, contact the Owner's Representative for an approved seeding application.
- B. Repair settlement and erosion which occurs prior to acceptance of work.
- C. Temporary Ditch Checks: Place rip rap check dams as shown or as directed by Owner's Representative.
- D. Leave ditch checks in place throughout construction except when ditches are fine graded, and seeded or sodded.
- E. Perform periodic maintenance on ditch checks to remove sediment and maintain erosion control as necessary so as not to inhibit flow or runoff.
- F. Install and maintain other sediment and erosion control measures as shown on the plans and details.
- G. No silting or washing of materials will be allowed to extend beyond the limits of the property. Should such silting or washing occur, construct and maintain a sediment basin at no expense to the Owner.

1.8 REFERENCE STANDARDS

- A. Determine soil's maximum dry density and optimum moisture in accordance with ASTM D698.
- B. Rock borings or soundings, if provided, are:
 - 1. For information purposes only.
 - 2. No guarantee of existing conditions.
 - 3. No substitute for investigations deemed necessary by Contractor.

1.9 QUALITY ASSURANCE

- A. The Owner will employ an independent testing agency to observe work and make tests required. The laboratory will:
 - 1. Observe proofrolling to determine adequacy of in-place soils.
 - 2. Test in-place soil, filled areas and compacted areas.
 - 3. Verify quantities of materials removed where unit prices are involved.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Excavated material, shall be free of roots, subsoil, debris, large weeds, toxic substances, and rocks greater than 1 inch.
- B. Engineered Fill: Shall be as specified below.
- C. Earth Fill: Reference
 - 1. Clean earth (free from organic material, and rocks over 6 inches in their longest dimension) shall be placed in lifts not to exceed 8 inches. Each lift shall be compacted to at least 95% of Standard Proctor maximum dry density (ASTM D693).
 - 2. Moisture content shall be at least 3% above optimum moisture content.
- D. Off-site Borrow (Earth Fill)
 - 1. Earth fill from an off-site borrow shall be tested and approved by the Geotechnical Engineer before being used as engineered fill.
 - 2. Off-site borrow material shall comply with the requirements specified for Earthwork.
- D. Shot Rock Fill: Reference

PART 3 - EXECUTION

3.1 PREPARATION

- A. Establish and identify required lines, levels, contours and datum.
- B. Maintain benchmarks, monuments, and other reference points. Reestablish if disturbed or destroyed, at no cost to Owner.
- C. Before start of grading, establish the location and extent of utilities in the work areas. Notify utilities to remove and relocate lines which are in the way of construction.
- D. Maintain, protect, reroute or extend existing utilities to remain which pass through the work area at Direction of the Owners Representative.
- E. Upon discovery of unknown utility or concealed conditions, discontinue affected work and notify the Owners Representative.

3.2 REMOVAL OF TOPSOIL

- A. Remove topsoil of horticultural value from areas to be excavated and regraded, and stockpile at a location to be determined by the Contractor and coordinated with the Owner's Representative. Refer to Geotechnical Study for stripping depth and topsoil. Contractor shall save enough topsoil for final dressing as necessary. The owner may use excess topsoil at his discretion. Excess topsoil shall be removed from site and the Contractor's responsibility to pay all associated cost.
- B. Do not permit topsoil to be mixed with subsoil.
- C. Do not strip topsoil when wet.

3.3 GENERAL SITE EXCAVATION

- A. Do not excavate wet subsoil materials.
- B. Excavate subsoil required to allow placement of compacted backfill under paving and site structures, and to accommodate construction operations.
- C. Machine slope banks to angle of repose or less until shored.
- D. Removed lumped subsoil, boulders and rock.
- E. Completely remove stumps, roots over 1 inch in diameter, and similar on-grade and below-grade obstructions within the area to be covered by new construction and for a distance of 10 feet beyond area in all directions. In other areas disturbed by grading, remove such obstructions to a depth of 2 feet below subgrade.
- F. Undercut exposed subgrade soils if recommended by the Geotechnical Engineer.
- G. Correct unauthorized excavation, including areas over-excavated by error, at no extra cost to the Owner.
- H. Stockpile excavated material in designated area on site to a depth not exceeding 8 feet and protect from erosion. Remove excess material not being reused from site. Stockpile areas are to be identified during a pre-construction meeting of the jobsite.
- I. If existing basements, cellars, cisterns, wells, septic tanks, drain fields, cesspools, catch basins, sink holes, manholes and similar items are encountered, remove to solid subgrade and break up masonry and/or concrete bottoms so that no pieces remain over 12 inches in their longest dimension.

3.4 PREPARATION OF NATURAL GROUND

- A. Proof-Roll in accordance with section 31 23 23. Owner's Representative is to identify any unstable areas.
- B. Unsuitable subgrades identified by the Owner's testing agency may attempt to be stabilized by, aerating and recompaction, if these procedures are approved by the geotechnical representative.
- C. If, after aeration and recompaction operations are completed, any exposed subgrades are determined by the Owner's testing agency as incapable of being stabilized in- place, perform remedial work as specified below.
- D. Cut, fill and grade to attain elevations indicated, +/- 0.1 foot tolerance, less allowances for placement of stone fill, concrete slabs, walks and topsoil.
- E. Earth fill shall be utilized under the building pad shall be as directed in Section 31 21 00.

- F. The use of mixed soil and rock fill shall be as directed in the Geotechnical Study by Terra Nova dated February 6, 2019.
- G. Earth engineered fill embankments or excavated slope should be inclined no steeper than: 3:1.
- H. The crests of slopes should be located at least 10' outside the limits of the structure.
- I. Outside of building, in areas designated to receive topsoil, grade or fill and compact to bring areas to finished grade, less 6" for placing topsoil.
- J. Where exterior walks are indicated, allow the placement of 4" granular fill and 4" of concrete.
- K. Within the perimeter of building, allow the placing of 4" granular fill and the thickness of concrete slab indicated on the drawings.
- L. Where drives and parking areas are indicated, grade, fill and compact to allow for placement of stone base and asphalt pavement thickness as indicated on the drawings.

3.5 REMEDIAL WORK

- A. If, after scarification, aeration and recompaction operations specified above are completed, any exposed subgrades are determined by the Owner's testing agency as incapable of being stabilized in-place, undercut to a depth identified by the testing agency and backfill under the appropriate provisions of Section 31 23 00 for the location.
 1. Notify the Owner's Representative to obtain approval prior to beginning undercutting operations.
 2. Keep records of material quantities removed and replace as specified in Division 1 and have materials verified by the Owner's testing agency.
 3. Removal and replacement of unsuitable soil beyond the depth indicated and as directed and approved by the Geotechnical Engineer shall be at no expense of the Owner.
- B. If required, excavate shallow temporary drainage ditches to facilitate removal of excess moisture from subgrade areas.
- C. Backfill and compaction of areas excavated under this Section is specified in Section 31 23 00.

3.6 FILLING AND COMPACTING

- A. The Contractor shall obtain any additional fill needed to complete the work from a borrow site approved by the Geotechnical Engineer.
- B. Before depositing fill, remove vegetation and other unsuitable material. Do not place fill on a subgrade that contains frost, is muddy or frozen.
- C. Fill with approved earth fill unless indicated on the drawings to fill with specified granular fill.
- D. After scarifying and proofrolling operations are completed and approved by the Geotechnical Engineer, deposit earth fill loose, horizontal layers not over 8" deep. Spread fill evenly and compact each layer uniformly with wedgefoot, rollers to specified densities before placing succeeding lifts.

3.7 MIXED SOIL AND ROCK FILL

Mixed soil and rock fill shall not be allowed.

3.8 CLEAN-UP AND DISPOSAL OF DEBRIS

- A. Remove surplus materials and debris from site.

END OF SECTION

**SECTION 31 23 00
BACKFILLING AND FINISHED GRADING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Finish grade sub-soil.
- B. Cut out areas to receive stabilizing base course materials for paving and sidewalks.
- C. Place, finish grade and compact top soil.

1.2 RELATED WORK

- A. Section 01 45 33: Testing Laboratory Services
- B. Section 31 00 00: Earthwork
- C. Section 31 22 00: Site Excavation
- D. Section 31 23 23: Proof Rolling

1.3 PROTECTION

- A. Prevent damage to existing trees to remain, benchmarks, pavement, and utility lines. Correct damage at no cost to the Owner.

1.4 QUALITY ASSURANCE

- A. Owner will employ a qualified testing laboratory to observe this work and make tests required. Testing Lab will:
 - 1. Have borrow fill, aggregate, sand and topsoil tested and approved before it is moved to the project site.
 - 2. Observe proof-rolling of site to determine adequacy of in-place soils. If soils are not adequate to bear weights which will be imposed, Testing Lab will direct corrective action to be taken.
 - 3. Test in-place soil and filled and compacted areas. If these are not adequate to bear weights imposed, Testing Lab will advise the Structural Engineer of his recommendations. He will direct any corrective measures that are necessary.
 - 4. Verify quantities of material removed and quantities of material placed, where Unit Prices are involved.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter. Use topsoil stockpiled on site if conforming to these requirements. If inadequate topsoil exists on site, contractor will be responsible for providing additional topsoil.

- B. Granular Backfill: Sound, free-draining sand, gravel or crushed stone with less than 10% passing the No. 200 sieve and maximum diameter of 1-1/2 inches.
- C. Engineered fill: Shall be as directed in the
- D. Common earth fill: Selected earth free from organic material, and rocks over 2 inches in their longest dimension.
- E. Shot Rock Fill: Reference
 - 1. Clean shot rock (maximum size is 18 inches) shall be placed in lifts not to exceed 24 inches. Each lift shall be compacted with a (20 ton) vibratory roller.
 - 2. Rock fill approved for use on site should consist of a densely graded mixture of rock fragments ranging in particle size from 18 inches in maximum dimension down to 1 inch, and containing less than 10% soil size particles by weight. The rock fill is to be placed in horizontal lifts not more than 24 inches thick and subsequently compacted to produce a stable, unyielding mass with essentially no voids. Compaction of the rock fill should be performed with a heavy (20 ton) vibratory roller. The compaction of the fill must be visually monitored by the geotechnical engineer, or his representative, and should entail at least 7 complete passes with the compaction equipment over each lift of fill.
 - 3. In order to facilitate excavations associated with foundations and/or utilities, the upper 2 feet of the fill pad can consist of surge-stone. Surge-stone consists of smaller sized rock (maximum 6 to 8 inch particles). The surge-rock should be placed in maximum 12 inch lifts and compacted similarly as that discussed above for shot-rock fill.

PART 3 - EXECUTION

3.1 BACKFILLING

- A. Examination: Verify fill materials to be reused are acceptable under requirements of the Contract Documents.
- B. Preparation:
 - 1. Proofroll subgrade prior to fill placement as specified in Section 31 23 23, and repair unstable subgrades prior to placement.
 - 2. As directed by the on-site geotechnical engineer, lime stabilization of the top 8" subgrade materials shall be required in all areas to receive pavement.
- C. Backfilling:
 - 1. Backfill areas to required elevations with unfrozen specified materials and compact to density equal to or greater than requirements specified below.
 - 2. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
 - 3. Place and compact materials in continuous layers not exceeding the following thickness in compacted depth:
 - a. Granular fill: 6 inches.
 - b. Cohesive fill: 8 inches.

4. Maintain soil at optimum moisture content of backfill materials for structurally loaded areas to attain required compaction density. Landscaped areas may be at optimum moisture content $\pm 2\%$.

D. Slopes:

1. Slope grade away from building minimum 0.2 feet in 10 feet unless indicated otherwise.
2. Make grade changes gradual. Blend slope into level areas.

E. Stockpile areas:

1. Remove surplus backfill materials from the site.
2. Leave areas completely free of excess materials.

F. Field quality control:

1. Field inspection and testing will be performed as defined in applicable Division of the specifications.
2. Test and analysis of fill materials will be in accordance with ASTM D698.
3. Compaction testing will be performed in accordance with ASTM D1557 or other Owner's Representative.
4. If test indicates the work of this Section does not meet specified requirements, remove, replace and retest materials at no cost to the Owner.
5. Proofroll compacted fill surfaces under slabs-on-grade and paving for a distance of 10 feet beyond slabs and paving in all directions under provisions of Section 31 23 23.

3.2 PROTECTION OF FINISHED WORK

- A. Recompact fills subjected to vehicular traffic.

3.3 SCHEDULE

- A. The paragraphs below identify location, fill material to be used (identified from lower to upper fill material), compacted thickness of each fill, and compaction expressed as a percentage of maximum density and optimum moisture in comparison with soil proctor specified above.
- B. Areas under building: Refer to Structural Specifications.
- C. Engineered earth fill embankments outside the ten (10) feet extension of the building perimeter to 98%.
- D. Seeded, sodded and landscaped areas: Engineered or earth fill to 6 inches below finish grade, compacted to 90%.
- E. Asphalt Paving: Engineered fill to 12 inches below finish grade compacted to 98%.
- F. Concrete paving: Engineered fill to 12 inches below finish grade compacted to 98%.
- G. Concrete walks and pads: Engineered fill to 12 inches below finish grade of aggregate course, compacted to 98%.

H. Uppermost 12 inches of engineered fill under asphalt and concrete pavement subgrades
Compacted to 98%.

I. Shot Rock Fill: Reference

1. Clean shot rock (maximum size is 18 inches) shall be placed in lifts not to exceed 24 inches. Each lift shall be compacted with a (20 ton) vibratory roller.

3.4 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to the following minimum depths, up to finished grade elevations:

1. 6 inches minimum to 18 inches maximum for lawn areas.
2. 12 inches minimum to 18 inches maximum for sports field.

B. Use topsoil in relatively dry state. Place during dry weather.

C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles and contours of sub-grades.

D. Remove stone (larger than 1 ½ inch), roots, grass, weeds, debris and other foreign material prior to spreading.

E. Manually spread topsoil around trees and plants to prevent damage which may be caused by grading equipment.

F. Lightly compact placed topsoil.

3.5 CLEAN-UP

A. Upon completion of work of this Section, clean up and leave area free of debris, excess material, and equipment.

B. Any excess earth shall be removed from the site by the contractor who shall properly dispose of the material.

END OF SECTION

**SECTION 31 23 23
PROOFROLLING**

PART 1 - GENERAL

1.1 RELATED WORK

- A. Section 31 11 00: Site Excavation
- B. Section 31 23 00: Backfilling and Finished Grading

1.2 QUALITY ASSURANCE

- A. The Owner will employ a testing agency to observe proof-rolling operations and make required test.
- B. Do not perform proof-rolling operations unless testing agency personnel are present.
- C. Neither proof-rolling operations or subsequent fill operations will be acceptable for payment unless testing agency personnel views proof-rolling.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Vehicle: Loaded tandem-axle rubber tire dump truck having a single axle weight of approximately 30,000 lbs, or similar equipment.

PART 3 - EXECUTION

3.1 PROOF-ROLLING

- A. Areas to proof-roll:
 - 1. Areas to be covered by construction.
 - 2. Areas to be covered with fill.
 - 3. Lawn areas attained by excavation.
 - 4. Areas 10 feet beyond the above areas in all directions.
- B. Observation: Run Vehicle at normal walking speed so that the testing agency Personnel may observe the ground at all times. Testing personnel will conduct additional test they deem necessary to determine existing conditions. Testing personnel will direct remedial actions they deem necessary.

3.2 REMEDIAL WORK

- A. Remedial work required by testing agency after viewing proof-rolling operations are specified in individual sections requiring proof-rolling.

- END OF SECTION -

**SECTION 31 25 00
EROSION AND SEDIMENT CONTROL**

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. The work includes the provision of temporary erosion control measures to prevent the pollution of air, water and land. Installation of temporary erosion control features shall be coordinated with the construction of permanent erosion control features to assure effective and continuous control of erosion.
- B. Comply with all applicable local, state and federal Erosion and Sediment Control Ordinances.
- C. Comply with the requirements of Stormwater Pollution Prevention Plan (SWPPP), Notice of Coverage (NOC) and the Erosion Protection/Sediment Control Plans (EPSC).

PART 2 – PRODUCTS

NOT APPLICABLE

PART 3 – EXECUTION

3.1 PREPARATION

- A. Gravel construction entrance: provide and maintain temporary roadways, 3 inches coarse aggregate minimum of 6 inches thick, 100 feet in length and 20 feet in width, at points of vehicular entrance and exit on the construction site. Gravel shall be specified in T.D.O.T., "Standard Specifications for Highway Construction" for Composite Mixture Base Course.
- B. Dust Suppressors: ASTM D-98 Calcium chloride, magnesium chloride, or other standard manufacturer's products designed for dust suppression. Apply dust suppressors in accordance with manufacturer's instructions. Protect treated surfaces from traffic for a minimum of 2 hours after treatment. Repeat application of dust suppressors as required to control dust emissions.
- C. Sediment Fences: Install posts at the spacing indicated, and at an angle between 2 degrees and 20 degrees towards the potential silt load area. Do not attach filter fabric to existing trees. Secure filter fabric to the post and wire fabric using staples, wire or hog rings. Embed the filter fabric to the ground as indicated. Splice fabric filter at the support pole using a 6-inch overlay and security seal. Top of the filter fabric shall have a 1-inch tuck or a reinforced top and section. Pre-assembled silt fences may be used.
- D. Gravel Dam Silt Trap: Provide adjusting dimensions to fit grading and location as indicated on drawings.
- E. Temporary Seeding: Provide in accordance with the approved Stormwater Pollution Prevention Plan (SWPPP).

3.2 MAINTENANCE AND INSPECTION

- A. Inspect erosion control devices weekly during dry periods, after each rainfall, and daily during prolonged rainfall. Remove sediment deposits after each rainfall or when sediment reaches approximately one-half the barrier height or storage capacity. Immediately repair damaged erosion control devices and damaged area around and underneath the devices. Maintain erosion control devices to assume continued performance of their intended function. Modify the erosion control plan as required to control problem areas noticed after each inspection.

3.3 CLEAN-UP

- A. At the completion of the job, or when directed by the Owner's Representative or Engineer, erosion control devices shall be removed. Erosion control devices and areas immediately adjacent to the devices shall be filled (where applicable), shaped to drain and to blend into the surround contours and grasses or landscaped as specified.

END OF SECTION

SECTION 31 31 16
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chemical soil treatment.
- B. Site-applied termiticide for wood, steel, and concrete.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.
- B. Soil Treatment: By the square yard (square meter) of treated soil. Includes applying toxicant to designated soil, re-treating when directed, warranty, annual inspections.

1.04 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
- B. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2006.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.
- E. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- F. Manufacturer's Instructions: Indicate caution requirement.
- G. Record and document moisture content of soil before application.
- H. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three (3) years of documented experience.
- I. Maintenance Data: Indicate re-treatment schedule .
- J. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of three (3) years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in the State in which the Project is located.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused by termites.
 - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
 - 2. Inspect annually and report in writing to Owner. Provide inspection service for 3 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

- A. Toxicant Chemical: EPA (Title 7, United States Code, 136 through 136y) approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.
- C. Manufacturers:
 - 1. Bayer Environmental Science Corp; www.backedbybayer.com/pest-management/#sle.
 - 2. FMC Professional Solutions; www.fmcprosolutions.com/#sle.
 - 3. Syngenta Professional Products; www.syngentaprofessionalproducts.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Mixes: Mix toxicant to manufacturer's instructions.

2.02 SITE-APPLIED TERMITICIDE

- A. Site Applied Termiticide for Wood, Steel and Concrete: Borate mineral salt based, spray applied termiticide formulated for use on wood, steel, concrete and other building materials.
 - 1. Active Ingredient: 40% minimum disodium octaborate tetrahydrate (DOT).
 - 2. Carrier and Penetrant: Proprietary glycol solution.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
- E. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- F. Re-treat disturbed treated soil with same toxicant as original treatment.
- G. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 INSTALLATION - SITE-APPLIED TERMITICIDE

- A. Comply with manufacturer's written instructions.

3.04 PROTECTION

- A. Do not permit soil grading over treated work.
- B. Protect sheet materials from damage after completed installation. Repair damage with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION

**SECTION 32 10 00
BASE COURSE FOR PAVEMENT**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Preparing subgrade to receive a base or pavement.
- B. Placing and compacting base material.

1.2 RELATED WORK

- A. Section 01 45 13: Testing Laboratory Services
- B. Section 31 11 00: Clearing and Grubbing
- C. Section 31 22 00: Site Excavation
- D. Section 32 12 00: Asphaltic Concrete Paving
- E. Section 32 13 00: Site Concrete Work

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with Tennessee Department of Transportation Standard Specifications for State Road and Bridge Construction, latest Edition herein referred to as "State Highway Specifications".
- B. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid asphaltic concrete.
- C. Owner will provide material testing and inspection for quality control during paving operations.

1.4 REFERENCE STANDARDS

- A. Gradation of stone materials will be performed in accordance with ASTM C136.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mineral aggregate base for asphaltic concrete pavement and concrete paving:
 - 1. Mineral Aggregate Base Stone – Section 303 – Type "A", Grading D.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify compacted subgrade is dry and has been approved to receive the work of this Section.
- B. Verify gradients and elevations of subgrade are correct.

C. Field Quality Control

1. Proofroll subgrades that have been exposed to weather under provisions of Section 31 23 23.
2. Remove materials identified by Testing Agency Personnel. Backfill and compact such areas as specified in Section 31 23 00.

3.2 PLACING BASE COURSE

- A. Perform aggregate blending by approved stationary or travel plant methods. Mixing in stockpiles or on roadway will not be acceptable.
- B. Spread base material uniformly over the area to produce required lines, grades and cross-sections after compaction.
 1. Indicated thickness of 6 inches or less may be constructed in a single course.
 2. Spread and compact thickness greater than 6 inches in at least 2 courses.
- C. Level and contour surfaces to the elevations and gradients indicated.
- D. Compact each layer to at least 98% of the maximum dry density as determined by ASTM D 1557.
- E. Adjust moisture content to achieve near optimum moisture content prior to compaction. If excess water is apparent, scarify aggregate and aerate to reduce the moisture content.
- F. Use mechanical hand tamping equipment in areas inaccessible to compaction equipment.
- G. Conduct one density test, in accordance with ASTM D2167, for each 2500 sq. yds. of in-place material, but in no case, not less than one daily for each layer.

3.3 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with a 10 ft straight edge.
- B. Scheduled compaction thickness: Within 1/4 inch.
- C. Variation from true elevation: Within 1/2 inch.

3.4 FINISHING AND MAINTENANCE

- A. Finish surfaces by rolling with a smooth steel wheel roller. Water the surface and spread loose stones prior to rolling.
- B. Repair soft, yielding areas that develop in the final rolling.
- C. Maintain final surface in smooth and uniform condition until base course is covered by subsequent pavement construction.
- D. Protect surface from silting or erosion until placement of final pavement construction.
- E. Where areas are disturbed by traffic, weather or other means, grade and recompact as necessary.

END OF SECTION

SECTION 32 11 23
AGGREGATE MATERIALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Aggregate materials for use as specified in other sections.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- B. Section 312300 – Excavation, Backfill, and Compaction for Structures
- C. Section 312313 – Excavation, Backfill, and Compaction for Pavement
- D. Section 312513 – Slope Protection and Erosion Control
- E. Construction Drawings and Report of Subsurface Exploration

1.3 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition.
 - 1. D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft²)(600 kN.m/m²)
 - 2. D 1556 Density and Unit Weight of Soil In Place by the Sand-Cone Method.
 - 3. D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort. (56,000 ft- lbf/ft²) (2,700 kN.m/m²)
 - 4. D 2167 Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
 - 5. D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - 6. D 2487 Classification of Soils for Engineering Purposes.
 - 7. D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
 - 8. D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 9. D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.
 - 1. TT 88 Particle Size Analysis of Soils.

1.4 QUALITY ASSURANCE

- A. Tests and analysis of aggregate materials will be performed in accordance with ASTM and AASHTO procedures specified herein.

1.5 SUBMITTALS

- A. Submit 100-pound sample of each aggregate or mixture that is to be incorporated into project in air-tight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be incorporated into project to the Engineer for review.
- B. Submit name of each material supplier and specific type and source of each material. Any change in source requires approval of Engineer.

PART 2 – PRODUCTS

2.0 MATERIALS

- A. Construction and materials shall meet or exceed requirements of this Section and applicable state highway department specifications section(s) referred to or noted on the Construction Drawings which pertain to paving base course design, materials, preparation, and execution. Materials shall be as indicated on Construction Drawings and shall comply with state highway department specifications regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

2.1 EQUIPMENT

- A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger any improvements by rutting, overloading, or pumping.

PART 3 – EXECUTION

3.1 STOCKPILING

- A. Stockpile on-site at locations indicated by Owner in such manner that there will be no standing water or mixing with other materials.

3.2 BORROW AND SPOIL SITES

- A. Upon completion of borrow and/or soil operations, clean up borrow and/or soil areas as indicated on Construction Drawings in neat and reasonable manner to proper owner's satisfaction.

END OF SECTION 32 11 23

SECTION 32 12 00
ASPHALTIC CONCRETE PAVING

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Mixing, spreading, compacting and finishing of bituminous pavements for base, leveling and surface courses on roads, parking lots, and other areas.

1.2 RELATED WORK

- A. Section 01 45 33: Testing Laboratory Services
- B. Section 31 11 00: Site Excavation
- C. Section 32 10 00: Base Course for Pavement
- D. Section 31 23 00: Backfilling and Finished Grading
- E. Section 32 17 23: Pavement Marking

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with the State of Tennessee Department of Transportation Bureau of Highways-Standard Specifications for Road and Bridge Construction, latest Edition, hereinafter referred to as "State Highway Specifications." Measurements and payments portions of those State Specifications do not apply to work performed under this contract.
- B. Mixing plant: Comply with requirements of State Highway Specifications.
- C. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid asphaltic concrete.

1.4 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, comply with the following minimum requirements.
 - 1. Test in-place asphaltic concrete courses for compliance with requirements for density, thickness and surface smoothness.
 - 2. Provide final surfaces or uniform texture, complying with required grade and cross sections.
 - 3. Take not less than 4 in. diameter pavement specimens for each completed course, from locations as directed by Owner's Representative.
 - 4. Repair holes from test specimens as specified for patching defective work.

B. Density

1. Compare density of in-place material against laboratory specimen of same asphaltic concrete mixture, when subjected to 50 blows of standard Marshall hammer on each side of specimen.
2. Minimum acceptable density of in-place course material is 97% of the recorded laboratory specimen density.

1.5 REGULATORY REQUIREMENTS

- A. Comply with applicable local standards, codes and ordinances for paving work on public property.

1.6 TESTS

- A. Testing and analysis of asphaltic mix will be performed under provisions of Section 01 45 33.

1.7 SUBMITTALS

- A. Samples: Provide samples of materials for laboratory testing and job-mix design as required by Owner's Representative.
- B. Certificates:
1. Provide certificates, in lieu of laboratory test reports.
 2. Certify that materials comply with specification requirements.
 3. Signed by asphaltic concrete producer and Contractor.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when the base surface temperature is less than 40° F.
- B. Do not apply materials when substrate is wet or contains sufficient moisture to prevent uniform distribution and proper penetration.

PART 2 - PRODUCTS

- A. Primer: Class MC-30 medium curing liquid asphalt in accordance with AASHTO M82.
- B. Tack Coat: AASHTO M-140 emulsified asphalt.
- C. Asphalt Cement: ASTM D946, 60-70 penetration grade.
- D. Aggregate: Sound and durable, angular crushed stone, sand or slag.
1. Coarse aggregate: ASTM D692
 2. Fine aggregate: ASTM D1073
- E. Mineral filler: Shall meet the requirements of AASHTO M17 finely ground particles of limestone, hydrated lime, portland cement, or other approved mineral dust, free from foreign matter.

2.2 ASPHALT PAVING MIX

- A. Use dry materials to avoid foaming. Mix uniformly.

- B. Mix designation: State Highway Specification Section 411 Grading E for asphaltic surface and Section 307 Grading BM2 for binder. Contractor to submit mix design for surface and binder courses.
- C. Job mix formula: Base on the Marshall design method for compaction of 50 blows each side of specimen and the following test criteria:
 - 1. Stability: 1,200 lbs minimum.
 - 2. Flow: .08 to .16 inch.
 - 3. Air voids: 3-5%.
 - 4. Asphalt cement: 5 to 7% of asphalt cement by weight in mixture.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Prepare mix materials and place of deposit in accordance with referenced state highway specifications.
- B. Prime Coat:
 - 1. Apply over substrate in accordance with the manufacturers printed instructions at the rate of 0.3 gal/sq. yd.
 - 2. Use clean sand to blot excess primer. Use only enough sand to prevent pick-up under traffic. Remove loose sand before paving.
- C. Tack Coat:
 - 1. Apply to contact surfaces of concrete items which abut pavement.
 - 2. Apply to contact surfaces of existing asphalt or concrete pavement at the rate of 0.15 gal/sq yd of surface.
- D. Frames of subsurface structures:
 - 1. Coat surfaces of new and existing frames with oil to prevent bond with asphalt paving.
 - 2. Set to be flush with finish surface and surround with a ring of compacted asphaltic concrete to one inch below top of frame. Adjust as required to meet paving.
 - 3. Provide temporary covers over openings until completion of rolling operations.

3.3 PLACING ASPHALT PAVEMENT

- A. Place materials in accordance with referenced State Highway Specifications.
- B. Place, spread and strike-off to compacted thickness indicated with paving machine, except that inaccessible and small areas may be placed by hand.

- C. Place topping course within 2 hours of placing prime coat.
 - D. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact area inaccessible to rolling equipment.
 - 1. Average relative density: Minimum of 97%.
 - 2. Individual relative density: Minimum of 94%.
 - E. Develop rolling with consecutive passes to achieve even and smooth finish of uniform texture, without roller marks.
 - F. Make joints between successive days work, or between old and new pavements in accordance with referenced State Highway Specifications. Ensure a continuous bond is attained.
- 3.4 TOLERANCES
- A. Flatness: $\pm 1/4$ -inch measured with a 10 ft. straight edge.
 - B. Compacted scheduled thickness: $\pm 1/4$ -inch of design thickness.
 - C. Variation from true elevation: 0.05 feet.
- 3.5 PATCHING
- A. Remove defective or deficient areas for full depth of course.
 - 2. Cut sides parallel and perpendicular to direction of traffic with edges vertical.
 - 3. Apply tack coat to exposed surfaces and place asphalt on prepared surfaces as specified above.
 - B. Repair and patch holes resulting from test cores as specified above.
- 3.6 FIELD QUALITY CONTROL
- A. Field inspection and testing will be performed as defined in applicable Division of the specifications.
- 3.7 PROTECTION
- A. Immediately after placement, protect pavement from mechanical injury for 7 days.
 - B. Cover openings of substrate structures in paved area until permanent coverings are placed.
- 3.08 SCHEDULE OF PAVEMENT SECTIONS
- A. Place and compact materials to the thickness called for on the Drawings.

END OF SECTION

**SECTION 32 13 00
SITE CONCRETE WORK**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Formwork complete with required shoring, bracing and anchorage.
- B. Concrete reinforcing, complete with required supports, spacers and related accessories.
- C. Cast-in-place concrete.
- D. Construction, expansion and contraction joints.

1.2 RELATED WORK

- A. Section 31 22 00: Site Excavation
- B. Section 31 23 00: Backfilling and Finish Grading

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301. Maintain one copy at the job site.
- B. Obtain materials from the same source throughout.
- C. Do not place concrete when base surface temperature is less than 40°F or forecast to go below 40° for 24 hours, and when surfaces are wet or frozen.

1.4 REGULATORY REQUIREMENTS

- A. Comply with local codes and ordinances for concrete work on public property.

1.5 TESTS

- A. Testing and analysis will be performed in accordance with practices specified elsewhere in the specifications.
- B. Submit the proposed mix design of each type of concrete at least two weeks prior to commencement of concrete work.
 - 1. Base material proportions on ACI procedures.
 - 2. Show type of materials, slump range, air content, aggregate gradation and 28 day compressive strength.
- C. The Owner's testing agency will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
 - 1. Four test cylinders will be taken for every 75 (or less) cubic yds of concrete placed each day.
 - 2. One slump test and air entrainment test will be taken for each set of cylinders taken.

- D. Verify results of tests for compliance with the Contract Documents.

1.6 SUBMITTALS

- A. Submit product data on joint filler, admixtures and curing compounds including properties, chemical composition and installation instructions.
- B. Submit shop drawings showing sizes and locations of reinforcing, splicing details and other pertinent installation details.
- C. Submit certification that concrete materials comply with referenced standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete materials:

1. Cement: ASTM C150 Type I portland cement, gray color.
2. Aggregates: ASTM C33.
3. Water: Clean and not detrimental to concrete.

B. Form materials:

1. Forms: Wood or steel form material profiled to suit conditions.
2. Joint filler: ASTM D994 bituminous type, 1/2 inch thick.
3. Form release agent: Colorless mineral oil which will not stain concrete or absorb moisture.
4. Fillets for chamfered corners: Wood or plastic strips sized to make a 3/4 inch chamfered corner, maximum possible lengths.

C. Reinforcement:

1. Reinforcing steel: ASTM A615 Grade 60, deformed billet steel bars, uncoated finish.
2. Welded wire fabric: ASTM A185 plain type in flat sheets, uncoated finish.
3. Tie wire: Minimum 16 gauge annealed steel.
4. Dowels: ASTM A615 Grade 40 plain steel, uncoated finish.

D. Admixtures:

1. Air entrainment: ASTM C260.
2. Water reducing: ASTM C494 Type F high range.
3. Accelerating: ASTM C494 Type C.
4. Set-retarding: ASTM C494 Type B.

E. Joint sealer: ASTM D1190 hot poured elastic type.

F. Curing compound: ASTM C309, Type 1-D, Class 2, 30% solids.

2.2 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Compressive strength:

1. Sidewalks, pads, curbs and gutters: 3500 psi at 28 days.
2. Vehicular pavements: 4000 psi at 28 days.

- C. Accelerating Admixtures: Use in cold weather only when approved by the Architect and Construction Manager. Use of admixtures will not relax cold weather placement requirements.
- D. Set Retarding Admixtures
 - 1. Use set-retarding admixtures in hot weather only when approved by the Owner representative.
- E. Do not add calcium chloride to concrete.

PART 3 - EXECUTION

3.1 PREPARATION OF BASE

- A. Verify that the supporting base is properly prepared and compacted, and true to line and grade.
- B. Moisten base to minimize absorption of water from fresh concrete.
- C. Notify the Construction Manager a minimum of 24 hours prior to commencement of concreting operations.
- D. Frames of subsurface structures: Coat surfaces of new and existing frames with oil to prevent bonding with concrete.
- E. Notify the Owner's testing agency a minimum of 72 hours prior to commencement of concreting operations.

3.2 FORM WORK

- A. Form Setting:
 - 1. Place and secure forms to correct locations, dimensions and profiles.
 - 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
 - 3. Construct forms sufficiently tight to prevent mortar leakage. Lock form section to be free from ply or movement in any direction.
 - 4. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.
 - 5. Provide chamfers at all exposed concrete edges.
 - 6. Apply form release agent to form surfaces in accordance with the manufacturer's printed instructions, before placing reinforcing and embedded items.
- B. Grade and Alignment:
 - 1. Check and correct the alignment and grade elevation of the forms immediately before placing the concrete.
 - 2. When any form has been disturbed or any grade has become unstable, reset and recheck the form.

3.3 REINFORCEMENT

- A. Ensure all reinforcing is clean, and free of rust, scale, oil, dirt or other materials which may reduce bonding.
- B. Have required bends made in the shop without heat.
- C. Place reinforcement in accordance with approved shop drawings.
- D. Interrupt reinforcement at expansion joints.
- E. Support reinforcing with precast concrete blocks, metal chairs or other method approved by the Architect. Supporting with gravel, brick or wood blocks is not permitted.

3.4 GENERAL CONCRETE PLACEMENT

- A. Place concrete in accordance with ACI 301. When central or transit mixed concrete is used, place the mixture where it will require as little rehandling as possible.
- B. Keep forms and subgrade moist during concrete placement.
- C. Ensure reinforcement, embedded items and formed joints are not disturbed during concrete placement.
- D. Do not allow concrete to free fall more than 3 feet.
- E. Distribute and spread concrete as soon as possible. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Thoroughly work concrete with suitable tools to remove coarse aggregate from the surface and to place mortar against the form. Work concrete to produce a smooth finish, free of air pockets, water pockets and honeycombs.
- G. Consolidate concrete against and along the faces of all forms and along the full length and on both sides of all joint assemblies with a suitable mechanical vibrator. Do not permit the vibrator to come in contact with forms, joint assemblies or subgrade. Do not over vibrate concrete or use the vibrator to transport or flow concrete.
- H. Ensure positive drainage to all drains and away from all window sills and door openings, unless specifically noted otherwise.

3.5 ARCHITECTURAL CONCRETE INSTALLATION

- A. Perform concrete installation in accordance with the preceding paragraphs.
- B. Control joints and expansion joints shall be provided in accordance with the plans.
- C. The concrete shall be screeded to the finished grade and floated to a uniform surface in the standard method.
- D. Color hardener shall be applied evenly to the plastic surface by the dry-shake method using a minimum of 60 pounds per 100 square feet. Apply in two or more shakes, floated after each and trowled only after the final floating.
- E. Follow curing procedures outlined in this section.

3.6 PAVEMENTS

- A. Longitudinal lines: Sawed or preformed, 3/8 inch wide x 1-1/2 inch deep, at approximately 12 ft. o.c. with equal spacing between slabs and parallel to the direction of travel.
 - 1. Joint Face: Metal key-way type with metal or wood forms.
 - 2. Tie bars: 1/2 inch diameter bars at 48 inches o.c.
 - 3. Place joint sealant to a minimum depth of 1/2 inch with approved backer materials.
- B. Transverse contraction and construction joints: 3/8 inch wide x 1/2 inches deep, at approximately 12 ft. o.c. and perpendicular to the direction of travel.
 - 1. Joints may be saw-cut, formed by hand of premolded filler.
 - 2. Provide load transfer device consisting of 3/4 inch diameter smooth dowels at 12 inches o.c. Coat dowels with a thick film of heave grease.
 - 3. Place joint sealant to a minimum depth of 1/2 inch with approved backer materials.
- C. Isolation Joints: Isolate objects abutting or adjacent to paved areas with premolded filler extended the full depth of the slab.
- D. Finishing:
 - 1. Finish concrete in the following sequence: Strike-off, consolidation, floating and removal of laitance.
 - 2. Provide light broom texture transverse to traffic flow direction.
 - 3. Round edges of each side of joints to a inch radius.
- E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturers printed instructions for the application.

3.7 CURBS

- A. Joints: Construct edges and joints as indicated.
 - 1. Expansion joints: Premolded joint filler at no more than 25 ft. o.c. Extend to within 1/4 inch of the surface.
 - 2. Contraction joints: Score joints at minimum spacing of 5 ft. o.c.
 - 3. Construct edges and joints as indicated.
- B. Provide for curb cuts, wheel chair ramps and drainage ways as indicated.
- C. Install premolded joint filler where curbs adjoin adjacent structures.
- D. Match existing curbs and curb and gutter sections flush.
- E. Hand work curbs as necessary to match drainage structures flush.
- F. Finishing: Finish with a light broom texture.

- G. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the applications.

3.8 WALKS

- A. Construct to general grade and spot elevations indicated. Wavy walks or walks that pond water are not acceptable.
- B. Construct with turned-down edges where indicated.
- C. Place short vertical curves where necessary and where change in grade exceeds 2%. Do not exceed 1/2 inch/ft. slope within 2 feet of top and bottom steps. Crown 1/4 inch/ft. or cross slope to maintain drainage.
- D. Joints:
 - 1. Install 1/2 inch premolded joint filler at no more than 25 feet o.c., at walk junctions and intersections, at top and bottom of steps, and where walks abut curbs, building, slabs or other fixed objects. Extend to within 1/4 inch of the surface.
 - 2. Install expansion joints in irregular walk sections at right angles to the walk centerline to create panels not exceeding 250 sq ft. Extend the full depth of the slab.
 - 3. Score joints at minimum spacing of 5 ft. o.c. With a suitable edging tool.
- E. Finishing:
 - 1. Slopes exceeding 6%: Finish with a bolted or heavy broom texture.
 - 2. Other surfaces: Finish with a light broom texture.
 - 3. Round edges, including each side of joints and grooves, to a 1/4 inch radius.
 - 4. Finish walks to be 1/4 inch above curb, and with a neat bevel at termination with curbs.
- F. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the application.
- G. Protection: Do not remove forms until at least 24 hours after paving. Protect walks from pedestrian traffic and applied loads for at least three days after paving.

3.9 DUMPSTER PAD

- A. Install pad in accordance with the general and spot elevations indicated. Provide a crown or cross slope at a minimum of inch/ft. across the pad.
- B. Construct the leading edge to form an exposed 8 inch barrier wall.
- C. Isolate footings from the pad with premolded joint filler.

- D. Finish pad surface and exposed edges to a smooth trowel finish.
- E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the application.
- F. Protection: Do not remove forms for at least 24 hours after completion of concrete placement. Do not allow any traffic or other loading on pad until test data reveals design strength has been attained.

3.10 EQUIPMENT PAD

- A. Install pad in accordance with the general contours and spot elevations indicated. Provide a crown or cross slope at a minimum of 1/4 inch/ft. across the pad.
- B. Place pad in minimum 6 inch thickness of granular fill, placed and compacted as specified in Section 31 23 00.
- C. Chamfer exposed edges 3/4 inch.
- D. Finish exposed surfaces to have a light broom texture finish.
- E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the application.
- F. Protection: Do not remove forms for at least 24 hours after completion of concrete placement. Do not allow any traffic or other loading on pad until test data reveals design strength has been attained.

3.11 SIGN POST FOUNDATION

- A. Post footings may be cast if excavations remain stable. Place forms if excavations will not remain stable.
- B. Place concrete to level of adjacent grades with slight crown to shed water.
- C. Ensure sign posts are plumb prior to initial set.

3.12 PROTECTION

- A. Protect installed items under provisions of Division 1 of the Specifications. In addition to specific protection measures specified above.
 - 1. Immediately after placement, protect pavement from premature drying, excessive temperatures and from mechanical injury. Maintain environmental and barrier protection for seven days after placement.
 - 2. Maintain concrete with a minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 3. Protect concrete from paint and stains.

3.13 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with practices specified elsewhere in the specifications.

B. Maintain records of placed concrete items. Record:

1. Date.
2. Location of pour.
3. Quantity.
4. Air temperature.
5. Test samples taken.

END OF SECTION

**SECTION 32 14 16
PERMEABLE CONCRETE PAVER SYSTEM**

PART 1-GENERAL

1.01 SECTION INCLUDES

- A. Providing labor, material, tools and equipment to furnish and install a permeable concrete paving stone system as indicated on the plans and as specified herein.

1.02 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. American Society for Testing and Materials (ASTM)

1.03 DEFINITIONS

- A. **Base Course:** Layer of open-graded aggregate beneath the bedding course layer, comprised of small-to-medium particle-sized stone (typically 1/2" to 1"). Depth of the sub-base layer shall be four inches (4").
- B. **Bedding Course:** Layer of open-graded aggregate directly beneath the unit pavers, comprised of small particle-sized stone chips (typically 1/4" to 3/8" rock). Also commonly called the "setting bed." Depth of the bedding course layer shall be two inches (2").
- C. **Bundle:** Several layers of paver clusters stacked vertically, packaged, and tagged for shipment. Also commonly called a "cube".
- D. **Chamfer:** A 45-degree beveled edge around the top of a paver unit, usually 1/8" to 1/4" wide. It facilitates snow removal, helps prevent edge chipping, and delineates the paving's individual units.
- E. **Cluster:** The group of pavers forming a single layer from a bundle of pavers or the group of pavers held by the clamp of a paver laying machine.
- F. **Flats:** The portion of the side of a paver other than the spacer bars.
- G. **Laying Face:** The working edge of the pavement where the laying of pavers is occurring.
- H. **Mechanical Installation:** The use of specialized machines to lift clusters of pavers from the bundles and place them on the prepared bedding course. These specialized machines are designed specifically for this application.
- I. **Method Statement:** The paver installer's and manufacturer's plan for construction and quality control of the pavers.
- J. **Spacer Bars:** Small protrusion on each side of pavers which are used to keep them uniformly spaced while minimizing chipping and spalling. Mechanically installed pavers must have spacer bars.
- K. **Sub-base Course:** Layer of open-graded aggregate beneath the base course layer, comprised of large particle-sized stone (typically 2-1/2" to 3" fractured rock). Depth of the sub-base course shall be twelve inches (12").

- L. **Void Filler:** Open-graded aggregate used to fill the openings in the paver units. The bedding course aggregate may be used as the void filler. Smaller particle-sized stone chips (1/8" to 1/4") are preferable.
- M. **Wearing Course:** The top surface of the paver surrounded by a chamfer.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. The Method Statement.
 - 2. The Quality Control Plan.
 - 3. Material samples of pavers, void filler aggregate, bedding course aggregate, base and sub-base course aggregate, including a current sieve analysis of each showing conformance to the specifications.
 - 4. A detailed description of the manufacturer's quality control procedures.

1.05 QUALITY ASSURANCE

- A. Quality Control Plan

The installer and manufacturer shall establish, provide and maintain a quality control plan. The quality control plan shall provide reasonable assurance that the materials and completed construction submitted for acceptance will conform to the contract requirements. The installer and manufacturer shall assume full responsibility for meeting all requirements.

- B. Sampling and Testing

The manufacturer shall employ an independent testing company, qualified to undertake tests in accordance with the applicable standards specified herein. Test results shall be provided to the installer and the owner, upon request.

Pavers shall be checked for density and dimensional variation, compressive strength (ASTM C140), density and absorption (ASTM C140) and abrasion resistance (ASTM C418).

- C. Method Statement

The installer and manufacturer shall prepare a Method Statement describing the overall plan to complete the work. This plan shall include at a minimum:

- 1. The quality control plan.
- 2. Clear diagrams showing the proposed starting point of the installation, the proposed direction of installation, progress on a week-by-week basis, and the dimensional controls to be used to maintain specified joint width and straight joint lines.
- 3. A description and the personnel and equipment to be employed for each portion of the work including manufacture, installation and quality control.

4. The installer's intention to machine-lay or hand-lay the pavers and provide qualifying experience to date for the appropriate method of proposed installation.

D. Qualifications

Every manufacturer and installer shall demonstrate that they have supplied and/or installed ecological pavers for projects of a similar nature, with regard to installation and production capacity of at least 100,000 square feet. Qualifications shall be submitted at the time of bid, without exception.

Paver Manufacturer's Qualifications

1. The manufacturer shall demonstrate a minimum of 3 years successful experience in the manufacture of interlocking concrete block pavers.
2. The manufacturer shall have sufficient production capacity and established quality control procedures to produce, transport, and deliver the required number of pavers with the quality specified, without causing a delay to the work.
3. The manufacturer shall have suitably experienced personnel and a management capability sufficient to produce the number of quality pavers as depicted on the contract drawings and as specified herein.

Paver Installer's Qualifications

1. Installers shall be required to provide their installation history, including references in writing with contact information, demonstrating to the satisfaction of the owner their ability to perform the paver installation and related work in the plans and specifications.
2. The installer shall have suitably experienced personnel and a management capability sufficient to execute the work shown on the contract drawings and specified herein.

1.06 DELIVERY, STORAGE AND HANDLING

1. Concrete paving stones shall be delivered to the site, with or without pallets, in such a way that no damage occurs to the product during hauling and unloading.
2. All pavers shall be delivered to the site in approximately the chronological order in which they were manufactured. They shall be staged on site, as per the method statement.
3. Each bundle of pavers shall be marked with a weather-proof tag identifying at a minimum the manufacturer, the date of manufacture, the mold number, the project name and phase for which the pavers were manufactured and the sequential bundle number.

PART 2 – PRODUCTS

2.01 ECOLOGICAL PAVERS

- A. All interlocking paving stones shall comply with the quality specifications for solid concrete interlocking paving units as required per ASTM C936.

1. **Portland Cement:** Conform to ASTM C150.
2. **Aggregates:** Conform to ASTM C33 for normal weight concrete aggregate (no expanded shale or lightweight aggregate) except that grading requirements shall not necessarily apply.
3. **Water:** Clean and free from any deleterious matter.
4. **Other Constituents:** Air-entraining admixtures, integral water repellents and finely ground silica shall have a proven record of performance and shall conform to the relevant ASTM standards.

Compressive Strength: At the time of delivery to the work site, the average compressive strength of the pavers shall not be less than 8,000 psi, with no individual unit less than 7,200 psi. Testing procedures shall be in accordance with ASTM C140 specifications.

5. **Absorption:** The average absorption shall not be greater than five percent (5%), with no individual unit result greater than seven percent (7%) per ASTM C140 specifications.
6. **Resistance to Freezing and Thawing:** The manufacturer shall satisfy the purchaser by laboratory testing that the paving units have adequate resistance to freezing and thawing per ASTM C67-83 specifications. The specimens shall have no breakage and not greater than one percent (1%) loss in dry weight of any individual unit when subjected to 50 cycles of freezing and thawing.
8. **Dimensional Tolerances:** Pavers shall be prismatic in plan and formed with straight, uniform edges. The tolerance for the flat portions of the sides shall not exceed 1/32" as measured with a steel straight edge. "Slumped" pavers exceeding this tolerance will be rejected. The length, width and thickness of the paving stones shall meet the allowable tolerance specified in ASTM C936.
9. **Color:** Monochromatic colors from standard range of colors and/or natural gray.

2.02 VISUAL INSPECTION

All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Minor cracks incidental to the usual methods of manufacture, or minor chipping resulting from customary methods of handling in shipment, delivery and installation, shall not be deemed grounds for rejection.

2.03 AGGREGATE MATERIALS

A. Bedding Course and Void Filler Aggregate

The bedding course and void filler aggregate shall be free of organics and soluble salts, or other contaminants likely to cause efflorescence. The grading requirements shall be in compliance with the following gradation chart.

ASTM Sieve Size	Percent Passing (by weight)
½ inch	100 -100
3/8 inch	94 -100
¼ inch	39 - 94
No. 4	23 - 39
No. 8	8 - 23
No. 16	0 - 8

B. Base Course Aggregate

The base course aggregate shall consist of open-graded stone and meet the following gradation chart.

ASTM Sieve Size	Percent Passing (by weight)
1-1/2 inch	100 - 100
1 inch	90 - 100
3/4 inch	48 - 90
1/2 inch	27 - 48
1/4 inch	12 - 27
No. 4	0 - 12

C. Sub-Base Course Aggregate

The sub-base course aggregate shall consist of open-graded stone and meet the following gradation chart.

ASTM Sieve Size	Percent Passing (by weight)
4 inch	100 - 100
3 inch	80 - 100
2-1/2 inch	50 - 80
2 inch	20 - 50
1-1/2 inch	5 - 20
1 inch	0 - 5

PART 3 – EXECUTION

3.01– SUBGRADE

The installer shall verify that the sub-grade has been shaped and compacted in conformance to the lines, grades and cross-sections shown on the plans, to provide for the construction of the pavement structure.

Site grades can be raised to the design sub-grade elevation using clean native earth fill (free of deleterious material). This fill should be placed in lifts not exceeding six inches (6”) and compacted to a minimum of ninety-five percent (95%) Standard Proctor density. The final sub-grade profile should be uniformly compacted to a minimum of ninety-eight percent (98%) Standard Proctor density and proof-rolled to delineate soft areas. Removing the unstable soil and replacing with clean, dry compacted earth fill shall be performed to repair these areas.

The sub-drain pipe shall consist of a six-inch (6”) diameter PVC perforated pipe wrapped with filter fabric. The pipe would be placed at sub-grade elevation and surrounded with a minimum of three-inches (3”) of approved open-graded stone. The sub-drain shall drain into a catch basin or other frost-free positive outlet.

3.02 – PLACEMENT OF SUB-BASE COURSE

The base course shall consist of a thickness of twelve inches (12") and be compacted using a vibratory smooth-drum roller. It shall be installed in lifts not to exceed six inches (6"). Upon completion of the sub-base course installation, the area shall be proof-rolled using a heavy rubber-tired vehicle (such as a loaded tandem truck) to identify any areas requiring additional compaction. The sub-base course shall be installed to the elevation and cross-section per the plan documents.

3.03 – PLACEMENT OF BASE COURSE

The base course shall consist of a thickness of four inches (4"), placed in one lift, and be compacted using a vibratory smooth-drum roller. The base course shall be installed to the elevation and cross-section per the plan documents.

3.04 – PLACEMENT OF BEDDING COURSE

The bedding course shall be spread loose in a uniform layer to give a depth after compaction of the paving units of about two inches (2"). The contractor shall screed the bedding course using either an approved mechanical screed beam apparatus or by the use of screed guides and boards.

The screeded bedding aggregate shall not be subject to any traffic by either mechanical equipment or pedestrian use prior to the installation of the paver units. The voids left after the removal of the screed rails shall be filled with loose aggregate as the paver bedding course proceeds.

6.05 – PLACEMENT OF ECOLOGICAL PAVERS

All edge restraints shall be constructed as shown on the plans and in place prior to the installation of the pavers.

The pavers shall be installed in approximately the order in which they were manufactured. No cluster shall be installed next to a cluster that was manufactured more than 1,000 cycles before or after.

Lay pavers in the pattern as shown on the drawings. Lay pavers away from the existing laying face or edge restraint in such a manner as to ensure that the pattern remains square. Chalk lines shall be used upon the bedding course to maintain straight joint lines. Joint spacing between pavers shall be between 1/8" and 1/4", however, the joint width may need to be increased to 3/8" (if necessary) to maintain straight joint lines. Lines and grades shown on the plans shall be established and maintained during the installation of the wearing course.

Pavers shall be cut using a table-mounted masonry saw. Block splitting shall not be permitted. All cut faces shall be vertical. Dry cutting of the pavers shall be performed utilizing a dust collection system.

Once the pavers have been placed upon the bedding course and all cut pavers have been inserted to provide a full and complete surface, inspect the pavers for damaged units and remove and replace those units. Once all pattern lines have been straightened, the void filler shall then be placed into the paver openings to the top of the chamfer on the pavers and the surface swept broom clean.

The pavement surface shall be compacted to achieve consolidation of the bedding course and paving stones and brought to design levels and profiles by two passes of a suitable plate compactor.

Compaction of the pavers shall be accomplished by the use of a vibratory plate compactor capable of a minimum of 4,500 pounds of compaction force. No compaction shall be permitted within three feet (3') of unrestrained edges of the pavement.

After compaction, inspect the pavers for damaged units and remove and replace those units. On completion of vibration after void filling, the surface tolerances shall be plus or minus $\frac{1}{2}$ " from finish levels. The pavers shall be flush to $\frac{1}{4}$ " above edge restraints.

Additional void filler material shall be swept in the paver voids to within $\frac{1}{2}$ " from the bottom of the chamfer on the paving stones. Upon completion, the wearing course surface shall be swept clean of all excess materials. Remove from the site all surplus materials, equipment and debris resulting from these operations.

PART 3 – MEASUREMENT AND PAYMENT

3.01 - MEASUREMENT

The permeable concrete paver system will be measured for payment on the basis of the actual square feet of pavers in place as determined by multiplying the length and width in feet.

3.02 - PAYMENT

Payment for the permeable concrete paver system shall constitute full compensation for furnishing and installing the concrete pavers, bedding course, base course, sub-base course, geotextile fabric, PVC drain pipe, and other incidental work necessary to complete the system.

END OF SECTION

The following list is an inventory of the materials palette to be used on Oakland Court, including plantings, groundcover, and hardscape, among others. The units of measurement include: individual units, square footage, square yardage, and linear footage. The list also shows the cost per unit of the materials as well as the total cost of the combined units throughout the site. The selection of trees covers a wide variety of uses, varying from shade trees to street trees, offering privacy and comfort for the residents. The planting palette also includes a variety of decorative shrubs and grasses, many of which address concerns of water quality, others work to improve the aesthetic value of the project. Additionally, turf is used to establish public open space, which provides space for residents to partake in a variety of flexible leisure activities. Irrigation systems of varying types, will be installed to maintain the green space. In the list below, irrigation is measured and valued as a lump sum, no unit information is specified. Using the listed materials, the goal is to provide thriving green spaces that work to increase the social and ecological potential of the site as well as facilitating varying levels of public to private access.

DESCRIPTION	QUANTITY	UNIT	COST	TOTAL
CANOPY TREES.....	145	EACH	\$ 350.00	\$ 50,750.00
UNDERSTOREY TREES.....	41	EACH	\$ 200.00	\$ 8,200.00
EVERGREEN TREES.....	23	EACH	\$ 200.00	\$ 4,600.00
LARGE EVERGREEN SHRUBS.....	26	EACH	\$ 50.00	\$ 1,300.00
SMALL EVERGREEN SHRUBS.....	126	EACH	\$ 30.00	\$ 3,780.00
LARGE DECIDUOUS SHRUBS.....	25	EACH	\$ 50.00	\$ 1,250.00
ORNAMENTAL GRASSES.....	25	EACH	\$ 20.00	\$ 500.00
WATER QUALITY PLANTINGS.....	1769	S.F.	\$ 4.50	\$ 7,960.50
TURF (SOD).....	14254.20	S.Y.	\$ 5.00	\$ 71,271.00
TRIPLEX FOUNDATION PLANTINGS.....	2	EACH	\$ 930.00	\$ 1,860.00
DUPLEX FOUNDATION PLANTINGS.....	24	EACH	\$ 760.00	\$ 18,240.00
SINGLE FOUNDATION PLANTING.....	20	EACH	\$ 590.00	\$ 11,800.00
PEDESTRIAN LIGHTING.....	45	EACH	\$ 5,500.00	\$ 247,500.00
BENCHES.....	6	EACH	\$ 1,500.00	\$ 9,000.00
4' WIDE ASPHALT TRAIL.....	1680	L.F.	\$ 40.00	\$ 67,200.00
IRRIGATION.....		L.S.		\$ 150,000
			Combined Total	\$ 655,211.5
			15% Contingency	\$ 98,281.73
			Grant Total	\$ 753,493.23

SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decorative aluminum fences.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- C. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints; 2002 (Reapproved 2017).
- D. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings; 2013 (Reapproved 2018).
- E. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments; 2008, with Editorial Revision (2017).
- F. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2016.
- G. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) ; 1993 (Reapproved 2019).
- H. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test; 2017.
- I. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2018.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings:
 - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- D. Samples: Submit two samples of fence panels, and screen material, 12 inch by 12 inch in size illustrating construction and colored finish.
- E. Manufacturer's Warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Decorative Metal Fences and Gates:
 - 1. Ameristar Perimeter Security, USA: www.ameristarfence.com/#sle.
 - 2. Ideal Aluminum Products: www.ideal-ap.com/#sle.
 - 3. Superior Aluminum Products, Inc: www.superioraluminum.com/#sle.
 - 4. Ultra Aluminum Manufacturing Inc: www.ultrafence.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FENCES

- A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
 - 1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.
- B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
 - 1. Total Coating Thickness: 2 mils, minimum.
 - 2. Color: As selected by Architect from manufacturer's standard range.
 - 3. Coating Performance: Comply with general requirements of ASTM F2408.
 - a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
 - b. Corrosion Resistance: ASTM B117, ASTM D714 and ASTM D1654; 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.
 - c. Impact Resistance: ASTM D2794; 60 inch pounds.
 - d. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.
- C. Aluminum: ASTM B221.
 - 1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
 - 2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
 - 3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.
- D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
 - 1. Tamper-proof security bolts.
 - 2. Self-drilling hex-head screws.
- E. Hinges: Finished to match fence components.
 - 1. Brackets: Round.
 - 2. Mounting: Center.
 - 3. Closing: Self.
- F. Latches: Finished to match fence components.
 - 1. Brackets: Round.
 - 2. Locking: Magnetic.

2.03 ALUMINUM FENCE

- A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.
 - 1. Fence Panels: 6 feet high by 6 feet long.
 - a. Panel Style: Two rail.
 - b. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
 - c. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.
 - d. Posts: Aluminum extrusions; 4 inches square.
 - e. Rails: Extruded aluminum channels.
 - 1) Double-walled aluminum U-channel; outside cross-section dimensions of 1-3/4 inch square; interior guide channel forms lower limit of raceway for retaining rod.
 - 2) Enclosed Retaining Rod: 1/8 inch diameter galvanized steel with variable pitch connection system for high angle racking and elimination of external fasteners.
 - 3) Picket-to-Rail Intersection Seals: PVC grommets.
 - f. Pickets: Extruded aluminum tubes.
 - 1) Size: 1-1/4 inch square.
 - 2) Style: Pickets with finial extend above top rail.
 - g. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.
 - h. Accessories: Aluminum castings, extrusions, and cold-formed strips; factory finished to match fence.
 - 1) Flat post cap.
 - i. Flexibility: Capable of following variable slope of up to 1:4.
 - j. Color: As selected by Architect from manufacturer's standard range.
 - B. Decorative Aluminum Post-and-Rail Fence and Swinging Gates:
 - 1. Style: Two-rail.
 - 2. Posts: Aluminum extrusions; 3 inch square.
 - 3. Color: As selected by Architect from manufacturer's standard range.
 - C. Mesh Fence Screen
 - 1. Vinyl coated polyester premium fence screen with 80-90% visual privacy blockage
 - 2. (HDPE) UV stabilized
 - 3. Reinforced edges with black binding and Stimpson Military-grade grommets spaced every 24" on all sides and triple grommet at corners.
 - 4. Provide for full height of aluminum fencing.
 - 5. Provide five year warranty.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing.
- C. When cutting rails immediately seal the exposed surfaces by:
 - 1. Removing metal shavings from cut area.

2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
 3. Apply two coats of custom finish spray paint matching fence color.
 4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.
- D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
 2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
 3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.
- E. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From Indicated Position: 1 inch.
- C. Minimum Distance from Property Line: 6 inches.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Post Settings: Randomly inspect three locations against design for:
 1. Hole diameter.
 2. Hole depth.
 3. Hole spacing.
- D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.
- E. Gates: Inspect for level, plumb, and alignment.
- F. Workmanship: Verify neat installation free of defects.

3.06 CLEANING

- A. Leave immediate work area neat at end of work day.
- B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- C. Clean fence with mild household detergent and clean water rinse well.
- D. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

3.08 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 33 05 00
EXCAVATING AND BACKFILLING FOR SERVICE UTILITIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Excavation for piped utility material.
- B. Provide necessary sheeting, shoring and bracing.
- C. Prepare trench bottom with appropriate materials.
- D. Dewater excavation as required.
- E. Place and compact granular beds, as required, and backfill.

1.2 RELATED WORK

- A. Section 01 45 33: Testing Laboratory Services
- B. Section 31 22 00: Site Excavation
- C. Section 31 23 00: Backfilling and Finished Grading
- D. Section 33 40 00: Storm Drainage Systems

1.3 TESTS

- A. Test and analysis of fill materials will be performed to determine compaction of trench backfill in accordance with ASTM D698 and under provisions of applicable Division of the Specifications.

- 1. Have aggregate tested prior to moving material to the job site.

1.4 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify the Construction Manager of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- D. Provide surface drainage to keep excavations free of water. Grade the top perimeter of excavations to prevent surface water run-off into excavations. Pump if required.
- E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- F. Protect Public utilities at project site property lines to prevent damage.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of the local department of public works and utility companies.

1.6 COORDINATION

- A. Schedule trench excavations so that those pipes passing under foundations are in place and trenches are properly backfilled before foundations are placed.
- B. Coordinate with other trades affected by this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe and structure bedding:
 - 1. Coarse aggregate: ASTM D448 Size No 57, pit run or natural crushed stone or gravel, free from shale, clay, friable material and debris.
 - 2. Fine aggregate: Clean, natural or manufactured sand, washed, free of silt, loam, friable or soluble materials, and organic matter, with no more than 15% finer than a No. 200 sieve.
- B. Trench and pit backfill:
 - 1. Engineered fill material specified in Section 31 23 00, for areas outside of building and pavement areas.
 - 2. Granular backfill for structural included paved loaded areas with 57 stone - full depth.

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum under provisions of the applicable division of the Specifications.

3.2 EXCAVATION

- A. General:
 - 1. Make excavations sufficiently wide to enable installation of utilities and allow inspection. Hand trim excavation and leave free of loose matter.
 - 2. Remove lumped subsoil, boulders, and rock.
 - 3. Depths: Unless otherwise indicated, excavate to a depth which will allow placement of pipes below frost line, but in no case less than 2 feet below finished grade.
 - 4. When excavation is in rock, overexcavate at least 6 inches and backfill with #57 stone for bedding.
 - 5. Do not allow excavation to interfere with normal 45° bearing splay of foundations.
 - 6. Correct unauthorized excavation at no cost to the Owner. Fill over-excavated areas under pipe bearing surfaces in accordance with direction by the Engineer.
 - 7. Provide separate trenches for water lines and sewer lines. Provide separation specified in individual utility Sections and as noted on the plans.
 - 8. Except topsoil, excavated material shall not be stockpiled on the site.
 - 9. Do not allow any pipe to be laid in wet, muddy or frozen trenches.

B. Trenches:

1. Bell and spigot type piping:

- a. Excavate trenches wide enough to allow for proper jointing, bedding and visual inspection of at least the top half of each side of pipe.
- b. Excavate to a depth below fill aggregate so that tops of all piping is at least one foot below bottoms of concrete slabs.
- c. Sewer and drain lines: Unless otherwise indicated, establish uniform rates of fall so that lines will have a drop of 1/4 inch per foot inside of the building, and 1/8 inch per foot outside of the building.
- d. Excavate so that bottom is uniformly smooth, and with bell holes scooped out so that the barrel of each length of pipe is fully supported.

2. Copper pipe, PVC pipe:

- a. Excavate to a depth below fill aggregate, or furrow out fill aggregate, as applicable, so that tops of all runs are at least 6 inches below bottoms of concrete slabs after bedding is accomplished.
- b. In earth fill below aggregate, excavate to a depth of at least 6 inches below bottoms of runs in final position and backfill with 1/4 " stone. Tamp stone to settle it and provide a smooth surface to uniformly support runs.
- c. In furrowed out fill aggregate, place at least 3 inches of 1/4 " down stone and tamp it smooth.
- d. Trenches may be narrow provided materials to be installed can be properly bedded, connected and inspected.

C. Pit Excavation:

1. Excavate pits for items such as, but not limited to, manholes, catch basins, and grease traps to depths required for proper installation of items.
2. Make bottoms smooth and level.
3. Overexcavate sides of pit enough to provide space for construction of forms or masonry work, as required, for proper installation and inspection.

3.3 INSPECTION

- A. Verify that stockpiled fill is approved.
- B. Verify that adjacent construction is braced to support surcharge forces imposed by backfilling operations.
- C. Verify areas to be backfilled are free of debris, snow, ice or water, and that ground surfaces are not frozen.

3.4 BACKFILLING

A. General:

1. Do not backfill until lines are installed, tested, and approved.
2. Support pipe and conduit during placement and compaction of bedding fill.
3. Backfill to contours and elevations. Backfill systematically, as early as possible, to allow maximum time for settlement. Do not backfill over porous, wet or spongy surfaces.
4. Place and compact fill materials in continuous layers not exceeding 6 inches in loose depth.
5. Maintain optimum moisture content of backfill materials to attain required compaction density.
6. Remove surplus backfill materials from the site.
7. Leave stockpile areas completely free of excess fill materials.

B. Backfilling pipe 4 inches in diameter and larger:

1. Bed pipe a minimum depth of 6 inches and extend to pipe springline. Place bedding to uniformly support pipe along the entire length and tamp to a dense condition.
2. Backfill with #57 stone in paved areas and any area within 5 foot of building footing and clean backfill in lawns or approved materials to level of adjacent grades by placing in 6 inch maximum lifts and compacting each lift as specified herein.

C. Backfilling pipe less than 4 inches in diameter:

1. Bed pipe a minimum depth of 3 inches and extend to one foot above top of pipe. Place bedding to uniformly support pipe along the entire length and tamp to a dense condition.
2. Backfill with approved materials to level of adjacent grades by placing in 6 inch maximum lifts and compacting each lift as specified herein.

D. Backfilling pits:

1. Do not backfill pits until items have been completed and tested.
2. Concrete, masonry and cast iron items: Backfill with coarse aggregate. Place aggregate in one foot layers and compact each layer after it is placed.
3. Where items are placed in lawn areas, fill aggregate to within 2 feet of finished grade, and finish backfilling to grade with earth fill. Tamp and compact earth fill to the same density as adjacent grade materials.
4. Where items are placed in areas covered by paving or other hard surfaced construction, fill with #57 stone to bottom of base course.

3.5 TOLERANCES

A. Top surfaces of backfilling: 1 inch.

3.6 COMPACTION

- A. Structural areas (outside of building pad): Compact to 95% of the maximum dry density in accordance with ASTM D 698 (standard proctor.) The top 8" of the fill should be compacted to 98% of standard proctor.
- B. Lawn and landscape areas: Compact to 95% of the proctor density specified.

3.7 CLEAN-UP

- A. After work of this Section is completed, leave areas clean and free from debris.
- B. After backfill is complete, remove excess fill material from the job site.

END OF SECTION

**SECTION 33 40 00
STORM DRAINAGE SYSTEMS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Installation of storm drainage systems.

1.2 RELATED WORK

- A. Section 33 05 00: Excavating and Backfilling for Service Utilities.
- B. Section 32 13 00: Site Concrete Work

1.3 REGULATORY REQUIREMENTS

- A. Comply with requirements of authorities having jurisdiction for materials and installation of work of this Section.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of applicable Division of the specifications.
- B. Accurately record locations of pipe runs, connections, catch basins, manholes, clean-outs and invert elevations.
- C. Identify and describe discovery of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

- A. Reinforced concrete pipe: ASTM C76 Class III, with Wall Type B mesh reinforcement, with bell and spigot end joints, size as indicated. Provide mortar joints.
- B. PVC pipe: ASTM D3034, SDR 26 or equal, bell and spigot type, solvent sealed end joints, size as indicated.
- C. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in configurations required.

2.2 CATCH BASINS

- A. Lid and frame: Cast iron construction, hinged lid linear grill lid design with lock down fasteners (as noted on the plans), size as indicated on plans.
- B. Shaft and cone section:
 - 1. Precast type: Reinforced precast concrete pipe sections of shape and size indicated, lipped male/female dry joints.
 - 2. Cast-in-place type: 3000 psi concrete as specified in Section 32 13 00, detailed as indicated.
 - 3. Masonry for adjustments: ASTM C32 Grade MS manhole brick, and ASTM C270 Type S mortar made with ASTM C150. Type II Portland cement, ASTM C33 sand and potable water.

- C. Base pad: 3000 psi concrete of type specified in Section 32 13 00, leveled top surface to receive concrete shaft sections, and sleeved to receive pipe sections.

2.3 MANHOLES AND CLEANOUTS

- A. Lid and frame: Cast iron construction, with removable lockable closed lid, size as indicated on plans.
- B. Shaft and cone section:
 - 1. Reinforced precast concrete pipe sections of shape and size indicated, with lipped male/female dry joints.
 - 2. Cast-in-place type: 3000 psi concrete as specified in Section 32 13 00, detailed as indicated.
 - 3. Masonry for adjustments: ASTM C32 Grade MS manhole brick, and ASTM C270 Type S mortar made with ASTM C150. Type II Portland cement, ASTM C33 sand and potable water.
 - 4. Ladder rungs: 3/4 inch diameter molded plastic into shaft sections at 12 inches oc.
- C. Base pad: 3000 psi concrete of type specified in Section 32 13 00, leveled top surface to receive concrete shaft sections, and sleeved to receive pipe sections.

2.4 HEADWALLS

- A. Materials: 3000 psi concrete as specified in Section 32 13 00, reinforced as indicated.

2.5 AGGREGATE BACKFILL

- A. Materials: ASTM C33 #57 Stone aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that excavation is ready to receive work of this Section, and that excavations, dimensions and elevations are as indicated on the Drawings.
- B. Do not install drainage structure until mass grading has resulted in rough subgrade elevations through the work area.

3.2 PREPARATION

- A. Prior to laying pipe, prepare a suitable bedding according to Section 33 05 00.
- B. Before placing pipe in the trench, field inspect for cracks or other defects; remove defective pipe from the construction site.
- C. Swab the interior of the pipe to remove all undesirable material.
- D. Prepare the bell end and remove undesirable material from the gasket and gasket recess.

3.3 INSTALLING STORM SEWER PIPE

- A. Lay pipe in a straight line on a uniform grade from structure to structure with the bell or groove end upgrade.

- B. Firmly support each section throughout its length and form a close concentric joint with the adjoining pipe.
 - C. Make junctions and turns with standard or special fittings.
 - D. Do not open more trench at any time than pumping facilities are able to dewater.
 - E. Whenever the work ceases, close the end of the pipe with a tight fitting plug or cover.
 - F. Close all openings provided for future use and abandoned pipe with a tight fitting plug sealed to avoid leakage.
 - G. When the pipe connects with structures, the exposed ends shall be placed or cut off flush with the interior face of the structure and satisfactory connections made.
 - H. Any pipe which is not in good alignment or which shows any undue settlement or damage shall be taken up and relaid without additional compensation.
 - I. Laying pipe and sealing joints shall be a continuous operation.
 - 1. Seal all joints during the same day in which the pipe is laid.
 - 2. Construct the joints in such a manner that a watertight joint will result.
 - J. Joints for rigid pipe:
 - 1. Portland cement mortar;
 - 2. Rubber gaskets; or
 - 3. Other types of joints recommended by the pipe manufacturer and approved.
 - K. For mortar joints, the pipe ends shall be thoroughly cleaned and wetted with water before the joint is made. Place stiff mortar in the lower half of the bell or groove of the pipe already laid and on the upper half of the spigot or tongue of the section to be laid. Tightly join sections with their inner surfaces flush and even. Smoothly finish the inside of the joint and remove any surplus material. Protect the complete joints against rapid drying with suitable covering material.
 - L. Install rubber ring gaskets to form a flexible watertight seal.
 - M. When other type joints are permitted, install or construct in accordance with the recommendations of the manufacturer.
 - N. Firmly join flexible pipe by approved coupling bands.
 - O. Inspect the pipe before any backfill is placed.
 - P. When strutting or vertical elongation is required, it shall be performed in accordance with the details shown on the Plans.
 - Q. Leave ties and struts in place until the embankment is completed, unless otherwise specified.
 - R. As the work progresses, clean the interior of all pipe in place.
 - S. Make connections by constructing catch basins, other structures, or by installing wyes or tees as shown on the Plans. Wyes and tees for future connections shall be installed as indicated.
- 3.4 INSTALLING CATCH BASINS, MANHOLES AND CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated. The shape of the inverts shall conform uniformly to inlet and outlet pipe with a smooth finish.
- D. Mount lid and frame level in grout, secured to top cone section to elevations indicated. Set true to line and grade and such that the entire surface of the casting is in contact with the bearing surface of the structure.
- E. All castings shall be set firm and snug and shall not rattle.

3.5 INSTALLING HEADWALLS

- A. Form and reinforce as indicated.
- B. Place and cure as specified in Section 32 13 00.
- C. Backfill with aggregate to level of adjacent subgrade.

3.6 FIELD QUALITY CONTROL

- A. Prior to placing aggregate cover, allow the Owner's Representative to observe installed pipe.
- B. Comply with requirements of authorities having jurisdiction for their requirements for inspection.

3.7 PROTECTION

- A. Protect finished installation under provisions of applicable Division of the Specifications.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

**SECTION 33 80 00
MISCELLANEOUS SITE UTILITIES**

PART 1 GENERAL

1.01 EXECUTION

- A. All site utilities and appurtenance shall be constructed and installed in accordance with the standards and specifications of the appropriate utility company.
- B. Miscellaneous utilities shall throughout this section mean underground electrical service, underground telephone, underground cable television and underground gas service.
- C. Miscellaneous utility trench may include electric service, telephone service, and cable television service.

1.02 RELATED WORK

- A. Section 31 11 00: Site Grading.
- B. Section 32 92 19: Seeding.

1.03 PROTECTION

The Contractor shall:

- A. Prevent damage to existing trees to remain, bench marks, pavement and utility lines. Correct damage at no cost to the Owner.
- B. Comply with applicable portions of the standards of the following agencies:
 - 1. Middle TN Electric Membership Corporation
 - 2. Atmos Natural Gas
 - 3. AT&T
 - 4. Comcast Cable

PART 2 UNDERGROUND ELECTRICAL SERVICE

2.01 GENERAL

- A. The Contractor will be responsible for underground electrical service excavation, backfilling and compaction as required by Middle TN Electric Membership Corporation (MTEMC.)
- B. The Contractor will coordinate installation of other miscellaneous utilities sharing the same trench.

2.02 PRODUCTS

- A. Electrical cable and conduit shall be provided and installed by MTEMC.

2.03 EXECUTION

- A. The width and depth to finished grade of the trench shall conform to the MTEMC Standards. If more than one electric cable or conduit is to be installed in a ditch, the width of the ditch may change.

- B. All electrical conduit in paved areas shall be backfilled to subgrade with crushed stone
- C. Backfilling of trenches shall be accomplished once MTEMC has approved the installation.
- D. Backfill shall consist of crushed stone, around the conduit for a depth of 6 inches above the conduit.
- E. Bedding shall consist of crushed stone for a depth of 6 inches below the conduit.
- F. All ditching shall remain open for inspection and approval by appropriate governmental agencies, the Owner's Representative; other utilities are to be allowed to use the ditch.
- G. Contractor shall be responsible for excavation and backfill for electrical manholes and switch pads to use the ditch.
- H. Backfill shall be as required by MTEMC.

PART 3 GAS SERVICE

- A. The Contractor shall coordinate installation of Gas mains with Atmos Natural Gas.
- B. No other utilities shall be allowed in the same trench as the gas service.

3.02 PRODUCTS

- A. Gas pipe shall be provided and installed by Contractor in accordance with Atmos natural gas standards.

3.03 EXECUTION

- A. Installation and Trench will be provided by Contractor in accordance with Atmos natural gas standards.

PART 4 TELEPHONE SERVICE

4.01 GENERAL

- A. The Contractor will be responsible for telephone service excavation, backfilling and compaction as requested by AT&T should they elect to utilize the same trench as MTEMC.
- B. The Contractor will coordinate installation of other miscellaneous utilities sharing the same trench.

4.02 PRODUCTS

- A. Telephone cable shall be provided by AT&T and all fees by contractor.

4.03 EXECUTION

- A. The width of the trench shall conform to the AT&T Standards.
- B. All telephone conduit in paved areas shall be backfilled to subgrade with crushed stone.

- C. Backfilling of trenches shall be accomplished once AT&T has approved the installation of the conduit.
- D. Backfill shall consist of crushed stone, sand or well compacted clean earth around the conduit for a depth of 6 inches above the conduit.
- E. All ditching shall remain open for inspection and approval by appropriate governmental agencies, the Owner's representative; other utilities are to be allowed use of the ditch.

PART 5 UNDERGROUND CABLE TELEVISION

5.01 GENERAL

- A. The Contractor will be responsible for cable trench excavation, backfilling and compaction as required by Comcast Cable should they elect to utilize the same trench as MTEMC.
- B. The Contractor will coordinate installation of other miscellaneous utilities sharing the same trench.

5.02 PRODUCTS

- A. Television cable shall be provided by Comcast Cable and contractor to pay any cost and fees.
- B. P.V.C. conduit will be furnished and installed by the contractor.

5.03 EXECUTION

- A. The width of the trench shall conform to Comcast Cable.
- B. All television conduit in paved areas shall be backfilled to subgrade with crushed stone.
- C. Backfilling trenches shall be accomplished once Comcast Cable has approved the installation.
- D. Backfill shall consist of crushed stone, sand or well compacted clean earth around the conduit for a depth of 6 inches above the conduit.
- E. All ditching shall remain open for inspection and approval by appropriate governmental agencies, the Owner's Representative; other utilities are to be allowed use of the ditch.

END OF SECTION