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END OF SECTION
Article 1 - Definitions:
Wherever used in these General Conditions or in the other Contract Documents, unless incompatible with the clear intent of the provision where used, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.1 Addenda - Written or graphic instruments issued by OPS prior to the opening of Bids, which clarify, correct or change the Bidding Documents or the Contract Documents. Unless attached to the OPS - Contractor Agreement, or referred to therein, and made a part thereof, no such addenda exist.

1.2 Agreement - The written Contract between Douglas County School District 001 (“OPS”) and Contractor entitled “Agreement Between Omaha Public Schools and Contractor” (herein and throughout the Contract Documents the “OPS Contractor Agreement” or “Agreement,” either of which terms may be used interchangeably and are hereby construed to synonymously refer to the signed Agreement between OPS and the Contractor) which covers the Work to be performed and has been executed by OPS and the Contractor. Other Contract Documents are attached to the Agreement and made a part thereof as provided therein or specifically made a part thereof by reference in the Agreement.

1.3 Application for Payment - The form accepted by Architect and the Program Manager (as hereinafter defined) to be used by Contractor in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4 Architect - the person who is identified in the Agreement to draft the Architectural and engineering design and documentation for the construction and, under directions of the PM, to administer the Agreement. The Architect shall be a person who is lawfully licensed in the State of Nebraska to practice Architecture or an entity made up of Architects licensed in Nebraska and lawfully practicing Architecture. The term Architect means the Architect and Architect’s authorized representatives.

1.5 Asbestos - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.6 Bid - The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed and the other information requested by the Bidding Documents.

1.7 Bidding Documents - The advertisement or invitation to Bid, instructions to bidders, the Bid form, sample forms, the Contractor’s Bid or portions of Addenda relating to any of these, or any other pre-bidding writing and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.8 Bonds - Performance and Payment bonds complying with the requirements of Paragraph 11.4 and other instruments of security.

1.9 Change Order - A document recommended by either the Architect, Program Manager or OPS, or any one of them, which is signed by Contractor and which is approved by the OPS Board of
SECTION 00 7201
GENERAL CONDITIONS

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1.9 Change Order - A document recommended by either the Architect, Program Manager or OPS, or any one of them, which is signed by Contractor and which is approved by the OPS Board of
Education and signed by OPS and authorizes an addition, deletion or revision in the Work or an adjustment in the Contract price or the Contract time, issued on or after the effective date of the Agreement.

1.10 **Contract Documents** - The Contract Documents consist of the Agreement, these General Conditions of the Contract for Construction, any Supplementary Conditions, and other Conditions, the Drawings as the same are more specifically identified in the Agreement, the Specifications, and all Addenda issued prior to the execution of the Agreement when attached as an exhibit to the Agreement and all Modifications issued after execution of the Agreement. A Modification is (1) a written amendment to the Agreement signed by both parties (but only after OPS has officially approved the amendment at an officially held meeting of the Board of Education), (2) a Change Order, (3) a written interpretation or clarification issued by Program Manager pursuant to the authority herein provided, on or after the Effective Date of the Agreement, or (4) a written Field Order for a minor change in the Work issued by the Architect pursuant to the authority herein granted. The Contract Documents do not include Bidding Documents or any other Documents, unless specifically enumerated in the Agreement as being a part of the Contract Documents. Shop Drawings Submittals approved in accordance with the provisions herein set forth and the reports and drawings, referred to in Paragraphs 7.1.1.1 and 7.1.1.2 are not Contract Documents.

1.11 **The Contract** - The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated Agreement between the parties hereto and supersedes all prior negotiations, representations, or Agreements, either oral or in writing. The Contract may be amended or modified only by a Modification as herein before defined in Paragraph 1.11 of this Article, definitions. The Contract Documents shall not be construed to create any Contractual relationship between the Architect and the Contractor, the PM and the Contractor or the Architect and the PM; however, either and both the Architect and the PM shall be entitled to performance of obligations intended for its, his, her, or their benefit and to rely upon and to enforce the terms and conditions of the Contract Documents. The Contract Documents shall not be construed to create any Contractual relationship between OPS, the PM or Architect and any Subcontractor or any Sub-subcontractor.

1.12 **Contract Price** - Is stated in the OPS-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by OPS to the Contractor for the performance of the Work under the Contract Documents.

1.13 **Contract Time and Days** - The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by Program Manager's written recommendation of final payment as hereinafter provided. As used in the Contract Documents, the term “day” shall mean calendar day unless otherwise specifically designated.

1.14 **Contractor** - the person, firm or corporation with whom OPS has entered into the Agreement for the Project and is referred to throughout the Contract Documents as if singular in number and either in the masculine, feminine or neuter gender. The term Contractor means either the Contractor or its authorized agent or agents.

1.15 **Defective** - an adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty, or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract
Documents, is damaged when installed, or has been damaged prior to Program Manager's recommendation of final payment unless responsibility for the protection thereof has been assumed by OPS at Substantial Completion as herein provided; or does not meet the generally accepted professional standards for the same or similar type Work performed in, near or around the location where the Work is or was performed.

1.16 **Drawings** - The drawings which show the scope, extent and character of the Work to be furnished and performed by Contractor and the design, location and dimensions of such Work and which have been prepared by Architect and approved by the PM and are referred to in the Contract Documents. Shop drawings are not drawings as so defined.

1.17 **Effective Date of the Agreement** - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

1.18 **Field Order** - A written order issued by the Architect and approved, in writing, by the Program Manager which orders minor changes in the Work in accordance with the provisions herein set forth but which does not involve a change in the Contract price or the Contract time.

1.19 **General Requirements** - Sections of Division 1 of the Specifications.

1.20 **Hazardous Materials** - The term Hazardous Materials shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC § 6903 et seq.), as amended from time to time.

1.21 **Laws and Regulations.** - (Laws or Regulations shall be included in the phrase “Laws and Regulations”). Any and all applicable governmental laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction over the Work, over OPS or Contractor, and the policies of OPS.

1.22 **Liens** - Liens, charges, security interests or encumbrances upon real property or personal property.

1.23 **Milestone** - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work. Any milestone set forth in the Contract Documents is of the essence.

1.24 **Notice of Award** - The written notice, signed by the PM on behalf of OPS after award of the Project by the Board of Education of OPS, to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein and in the Contract Documents, within the time specified, OPS will sign and deliver the Agreement. The Notice of Award is void and of no effect if the apparent successful bidder fails to execute all or any part of
the Contract Documents within the time specified in the Notice of Award and the Contract Documents.

1.25 **Notice to Proceed** - A written notice given by the PM on behalf of OPS to Contractor (with a copy to Architect) fixing the date on which the Contract time will commence to run and on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

1.26 **OPS** - Douglas County School District 001, a Nebraska Political Subdivision and the entity for whom the Work is to be performed. The term OPS means the Douglas County School District 001, or its authorized representatives, employees, the Board of Education, members of the Board of Education and authorized agents. Douglas County School District 001 is herein and throughout the Contract Documents called “OPS.” The chief executive officer of OPS is the Superintendent of schools (hereinafter called “Superintendent”).

1.27 **Partial Utilization** - use by OPS of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.28 **PCBS** - Polychlorinated biphenyl.

1.29 **Petroleum** - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous wastes and crude oils.

1.30 **Product Data** - The illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, design, fixture or system for some portion of the Work.

1.31 **Program Manager (PM)** - The entity named in Subparagraph 1.31.1 below, or its successor, which has been engaged by OPS to assist with the monitoring, coordination, communication, and administration of the 1999 OPS Facilities Bond Program pursuant to an Agreement between OPS and the Program Manager (“Program Manager Agreement”) (hereinafter referred to as the “Bond program”). The PM will provide administration of the Agreement as described in the Contract Documents and as described in the Program Manager Agreement.

   1.31.1. Jacobs Facilities, Inc. (herein called “Program Manager” or “PM”) is the corporation retained by OPS as the Program Manager.

   1.31.2. Contractor's Obligations -- Except as herein expressly provided, the Contractor shall not be relieved of his obligations to perform the Work in accordance with the Contract Documents by the activities or duties of OPS, Architect or PM, or any one or more of them.

   1.31.3. Additional Consultants or Program Managers - Program Manager may hire or retain one or more persons, firms or corporations to furnish services as a consultant to Program Manager, an independent professional associate, an independent Contractor or advisor with respect to the Work and/or Project.
Such persons, firms or corporations shall be paid directly by Program Manager and neither OPS or the Contractor shall have any liability therefore. OPS may, in its sole and absolute discretion, from time to time, and at any time, name a new or successor Program Manager.

1.32 **Project** - The total construction of which the Work to be provided under the Contract Documents may be the whole or a part.

1.33 **Radioactive Material** - Source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (42 USC § 2011 et seq.) as amended from time to time.

1.34 **Resident Project Representative** - (hereinafter sometimes referred to as “RPR”) the authorized representative of Program Manager who may be assigned to the site or any part thereof pursuant to these General Conditions.

1.35 **Samples** - Physical examples of materials, equipment, or Workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work, or the Work as a whole, will be judged.

1.36 **Shop Drawings** - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for Contractor or any subcontractor, manufacturer, supplier, or distributor and submitted by Contractor or any subcontractor, manufacture, supplier, or distributor to illustrate some portion of the Work.

1.37 **Specifications** - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and Workmanship as applied to the Work and certain administrative details applicable thereto. Specifications determine nature and setting, Workmanship and quality of materials; drawings establish the design, quantities, dimensions and details; schedules give locations.

1.38 **Subcontractor** - A person, firm, corporation or entity who has a direct Contract with the Contractor to perform any of the Work at the site. The term subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and includes any sub-subcontractor (i.e., a person, firm, corporation or entity that has a direct or indirect Contract with a subcontractor to perform any of the Work at the site) or representative of a subcontractor or sub-subcontractor.

1.39 **Substantial Completion** - Substantial Completion is the moment in time when the Work (or a specified part thereof) has progressed to the point where, in the opinion of OPS, the Architect and PM as evidenced by Architect’s definitive Certificate of Substantial Completion, signed by the Architect and PM and approved by OPS, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof. Whenever in the opinion of Architect any Section or portion of the Work may be used or occupied by OPS without interference to the remaining Work, such Section or portion may be so used and occupied and neither such partial use and occupancy nor any insurance, if any, purchased by OPS in connection therewith shall constitute an acceptance of such Work or any portion thereof as either substantially completed or complete. The approval of OPS with respect to the portions to be so used or occupied, shall also
state the date or dates of commencement of Contractor’s warranties and OPS’s obligation to maintain.

1.40 **Supplementary Conditions** - the part of the Contract Documents, which amends or supplements portions of the General Conditions.

1.41 **Supplier** - A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct Contract with Contractor or with any subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

1.42 **Underground Facilities** - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, water or geothermal loop heat exchange system.

1.43 **Work** - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes all labor, material, equipment and services necessary to produce the construction for which the Contractor has Contracted to perform and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing Documents, all as required by the Contract Documents. It also includes all plant, supplies, skill, supervision, transportation, services and other facilities and things necessary or proper or incidental to the carrying out and completion of the terms of the Contract Documents and all other items of cost or value needed to produce, construct, and fully complete the Project identified by the Contract Documents.

1.44 **Work Change Directive** - A written directive to Contractor, issued on or after the effective date of the Agreement and signed by OPS and recommended by Program Manager, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as hereinafter provided in these General Conditions or to emergencies as herein indicated. A Work change directive will not change the Contract price or the Contract time, but is evidence that the parties expect that the change directed or documented by a Work change directive may be incorporated in a subsequently issued change order following negotiations by the parties as to its effect, if any, on the Contract price or Contract time as herein provided. Any Work change directive which results in a change in Contract price and/or Contract time and is not caused by a differing or unforeseen physical condition as defined herein, or to an emergency as herein provided, and which has not been approved by the Board of Education of OPS shall not be the basis of subsequent change order.

1.45 **Written Amendment** - A written amendment of the Contract Documents, signed by OPS and Contractor on or after the effective date of the Agreement and normally dealing with the non-
Architectural or non-technical rather than strictly construction related aspects of the Contract Documents.

ARTICLE 2 - Preliminary Matters

2.1 Delivery of Bonds and Insurance Certificates

2.1.1. When Contractor delivers the executed Agreement to OPS, Contractor shall also deliver to the PM the Bonds and Certificates of Insurance that the Contractor is required to furnish in accordance with the Contract Documents.

2.2 Commencement of Contract Time; Notice to Proceed

2.2.1. The Contract Time will commence to run:

2.2.1.1. On the later to occur of the day after the Effective Date of the Agreement or the date when Contractor has delivered the executed Agreement Bonds and Certificates of Insurance,

2.2.1.2. Such other date as may be established in the Agreement, or,

2.2.1.3. If a Notice to Proceed is to be given under the terms of the Agreement, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days of the Effective Date of the Agreement. In no event will the Contract Time commence to run later than the thirtieth (30) day after the Effective Date of the Agreement or sixty (60) days after Notice of Award, whichever date is earlier.

2.3 Starting the Work

2.3.1. The Contractor shall start to perform the Work on the commencement date established as provided in Article 2.2.1, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

2.4 Before Starting Construction

2.4.1. By executing the Agreement, the Contractor represents that Contractor has visited the site, is familiar with the local conditions under which the Work is to be performed, and correlated Contractor’s observations with the requirements of the Contract Documents.

2.4.2.1. Before undertaking any part of the Work, the Contractor shall carefully study and compare the Contract Documents and check and review the figures shown thereon and on all applicable field measurements, drawings, specifications, and plans, and shall at once report to the Architect, in writing, any error, ambiguity, inconsistency, or omission he may discover. The Contractor shall, at the time he reports to the Architect, send a copy of such written report to the PM. The Contractor shall obtain a written interpretation or clarification from the Architect before proceeding with any Work affected by the error, ambiguity, inconsistency, or omission Contractor discovered. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or
omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

2.4.2.2. Before ordering any material or doing any Work, the Contractor shall review all dimensions and check all conditions in order to assure himself that they properly reflect those on the drawings. Any inconsistency shall be brought to the attention of the Architect, with a copy of the report to the PM.

2.4.2.3. The Contractor shall be responsible for verifying all quantities of materials shown in the Contract Documents before ordering same, as payment is provided for acceptable materials complete in place. Materials rejected due to improper fabrication or excess quantity or for any other reason within the control of the Contractor will not be paid for regardless of the quantities or dimensions shown on the plans.

2.4.3. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data, or Samples for such portion of the Work.

2.4.4. Within 20 calendar days after the Effective Date of the Agreement (unless otherwise specified in the Supplemental Conditions), Contractor shall submit to the Architect and the PM for review:

2.4.4.1. A progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2.4.4.2. A schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal; and

2.4.4.3. A schedule of values for all of the Work which will include prices of items aggregating the Contract Price (called "values" for convenience) and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work so that the sum of the items will total the Contract Price. Such schedule of values will be prepared so as to facilitate payments by the Contractor to his subcontractors and shall follow the trade divisions of the specifications so far as practicable. Such schedule and the amount therein shall be in such detail and supported by such data to substantiate its accuracy as the architect or PM, or both, may require. Such schedule, when approved by the architect and PM, unless it is found to be in error, shall be used only as a basis for the contractor's Applications for Payment and shall not be taken as evidence of market or other value.

2.4.5. Herein and in the other Contract Documents the schedule required by Subparagraphs 2.4.4.1 and 2.4.4.2 shall collectively be referred to as the "progress schedule." The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The schedules herein in this Paragraph 2.4.4 required shall be revised as required by the conditions of the work, subject to the Architect’s and PM’s approval, as herein provided.
2.4.6. Before any Work at the site is started, Contractor shall deliver to OPS, with copies to each additional insured identified in the Supplementary Conditions, the certificates of insurance (and other evidence of insurance which OPS or any additional insured may reasonably request) and all Bonds Which Contractor is required to purchase and maintain as herein provided.

2.5 **Products Used And Objection Thereto**

2.5.1. Within an agreed upon number of days from the Effective Date, the Contractor shall provide a list showing the name of the manufacturer proposed to be used for each major product identified in the specifications and the name of the installing subcontractor, if any, to the Architect.

2.5.2. Architect will reply in writing to the Contractor within fourteen (14) Working days of the receipt of such list stating whether OPS, the Architect or the PM, after due investigation, has objection to any such proposed product and/or the installing subcontractor. If adequate data on any proposed manufacturer or installer is not available, Architect may state that action will be deferred until Contractor provides further data. Failure of Architect to reply shall constitute notice of no objection. Failure to object to a manufacturer shall not constitute a waiver of any requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements. Approval of any manufacturer and/or installing subcontractor does not relieve the Contractor of his warranties or duties established in the Contract Documents.

2.6 **Preconstruction Conference:**

2.6.1. Within twenty (20) days after the Contract Time starts to run, but before any Work at the site is started, a conference attended by Contractor, Architect, PM, one or more designees of OPS, and others as appropriate will be held to establish a Working understanding among the parties as to the Work and to discuss the progress schedules referred to in Paragraph 2.4.4, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

2.7 **Initially Acceptable Schedules:**

2.7.1. Prior to the first Application for Payment a conference attended by Contractor, Architect, PM, one or more designees of OPS, and others as appropriate will be held to review for acceptability to Architect and PM as provided below the progress schedule submitted in accordance with Paragraph 2.4.4. Contractor shall have an additional ten (10) days to make corrections and adjustments and to complete and resubmit the progress schedule. No progress payment shall be made to Contractor until the progress schedule (or an appropriate early start schedule) are submitted to and acceptable to the Architect, PM and OPS as provided below. The progress schedule will be acceptable to Architect, PM and OPS as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Time but such acceptance will neither impose on Architect, PM or OPS responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor. Contractor's schedule of Shop Drawing and Sample submissions must be acceptable to Architect and PM as providing a
Workable arrangement for reviewing and processing the required submittals. Contractor’s schedule of values must be acceptable to Architect and PM as to form and substance.

Article 3 - Contract Documents

3.1 Execution, Correlation And Intent

3.1.1. The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated Agreement of the parties concerning the Work and supersedes all prior negotiations, representations, or Agreements, either written or oral. The Contract Documents will be construed in accordance with the laws of the State of Nebraska. It is hereby agreed by the parties that for any lawsuit to enforce the provisions of the Contract Documents or arising out of the Work, venue and jurisdiction is only proper in the State courts of the County of Douglas, State of Nebraska, and the Contractor and any person, entity, corporation, or Subcontractor acting pursuant to the Contract Documents hereby submits to the jurisdiction of the State courts of Douglas County, Nebraska.

3.1.2. The Contract Documents shall be signed in not less than triplicate by OPS and Contractor, any one of which shall be considered the complete Contract. If either OPS or the Contractor or both do not sign the General Conditions of the Contract for Construction, any Supplementary Conditions, Drawings, Specifications, or any of the other Contract Documents, the Architect shall identify such Documents. Failure of the Contractor to sign any such Contract Document shall not make the Contract Documents void nor alleviate the Contractor from complying with the terms and conditions set forth in the unsigned Contract Documents.

3.1.3. OPS shall furnish to Contractor an agreed upon appropriate number of copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents (including drawings and specifications) as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at actual cost of reproduction.

3.1.4. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be finished and performed whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe Work. Materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Architect shall issue clarifications and interpretations of the Contract Documents as provided herein.

3.1.5. OPS has or expects to have only limited funds for this Project and under no circumstance shall it be obligated or required to pay for, or in connection with, the Work any sum greater than the Contract Price as adjusted by properly executed, written Change Orders signed by OPS in accordance with the procedures set forth elsewhere in the Contract Documents. Any claims by Contractor for any increase in the Contract Price and/or for any extra costs or damage shall be governed in accordance with the provisions herein set forth and none other.
It is expressly provided that this provision shall not apply to nor limit any right of the Contractor elsewhere provided in the Contract Documents as to extensions of time for performance, or claims made in accordance with Paragraph 14.3.1.

3.1.6. The organization of the Specifications into divisions, Sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

3.1.7. The use of headings in the Contract Documents, including the Supplemental Conditions, is for the assistance of the reader and headings are not a part of the Contract Documents. The headings may not be used to contradict the language of any paragraph or subparagraph, or be used in construing the intent of the parties. The failure of any portion of the Supplemental Conditions to place new or amended language in quotation marks does not invalidate the new or amended language; neither does the failure to state that the new or amended paragraph or subparagraph "remains in effect as amended" effect the validity of any amendment.

3.1.8. Titles to articles, divisions, Sections and paragraphs in these Contract Documents are introduced merely for convenience and are not to be taken as a part of the specifications and are, furthermore, not to be taken as a correct or complete segregation of the several units of material and labor. No responsibility, either direct or implied, is assumed by OPS for omissions or duplications by the Contractor or his subcontractor, due to real or alleged errors in arrangement of matter in these Contract Documents.

3.1.9. The past, present or future tense shall each include the other; pronouns of any gender shall mean the masculine, feminine and neuter genders; and words in the singular shall include the plural.

3.1.10. In case of conflict, the Supplementary Conditions shall control over the provisions of the General Conditions of the Contract for Construction.

3.1.11. OPS does not waive any of its immunities from lawsuit or damages, or both, as provided by the Nebraska Political Subdivision Tort Claims Act (§§ 13-910, et seq., Neb. Rev. Stat., as amended) as a public institution, or as may be otherwise provided, whether by common law or statute, and nothing contained in the Contract Documents or any action required of OPS by the Contract Documents shall be interpreted to be such a waiver. In no case does OPS consent to the awarding or granting to any party to litigation under the Contract Documents or on account of the Work any attorney's fees as against OPS.

3.1.12 Contractor shall utilize the PM Automated Project Management Control System (PMCS) to administer those services identified in these General Conditions of the Contract for Construction. The PMCS will be available via the Internet and will implement the use of electronic submission of information for review, responses and approvals as required to administer the Contractor's Work on the Project.

3.2 Ownership and Use of Documents

3.2.1. All Drawings, Specifications and copies thereof furnished by the Architect are the property of OPS. They are to be used only with respect to this Project and are not to be used by the Contractor on any other Project. With the exception of one Contract set for the Contractor,
such Documents are to be returned or suitably accounted for to the PM on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of OPS’s ownership rights.

3.3 Reference to Standards and Specifications of Technical Societies; Reporting and Resolving Discrepancies

3.3.1. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Law or Regulation in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2. If, during the performance of the Work Contractor discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in the Contract Documents, Contractor shall report it to Architect, in writing, at once, with a copy to the PM, and Contractor shall not proceed with the Work affected thereby (except in an emergency as authorized herein) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated herein; however, so long as a material conflict, error, ambiguity or discrepancy was not otherwise waived, Contractor shall not be liable to OPS, the Architect or PM for failure to report any such conflict, error, ambiguity or discrepancy, unless Contractor knew or reasonably should have known thereof.

3.3.3. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods herein indicated, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

3.3.3.1. The provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2. The provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Laws or Regulations).

3.3.4. No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OPS, Architect, PM or Contractor, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OPS, Architect, PM or any of OPS’s, Architect’s and/or PM’s consultants, agents, attorneys or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with any provisions of the Contract Documents.
3.3.5. Whenever in the Contract Documents the terms “as ordered,” “as directed,” “as required,” “as allowed,” “as approved” or terms of like effect or import are used or the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” or “satisfactory” or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of Architect or PM, or both, as to the Work, it is intended that such requirement, direction, review, or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Architect or PM, or both, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty, or authority, to undertake responsibility contrary to the provisions of the Contract Documents.

3.3.6. Should drawings disagree in themselves or with the Specifications or should separate portions of the Specifications so disagree, or should the Contract Documents be otherwise internally inconsistent, the better quality or greater amount of Work or materials shall be estimated upon, and unless otherwise ordered by the Architect or Program Manager, in writing, shall be performed and furnished. Figures given on drawings govern scale measurements, and large-scale details govern small drawings.

3.4 **Amending and Supplementing Contract Documents**

3.4.1. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in only the following ways:

3.4.1.1. A formal written Modification;

3.4.1.2. A Change Order (as herein provided); or

3.4.1.3. A Work Change Directive (as herein provided).

3.4.2. In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, which do not involve a change in the Contract Price or Contract Time, in one or more of the following ways:

3.4.2.1. A Field Order (as herein provided);

3.4.2.2. Architect’s approval of a Shop Drawing or Sample (as herein provided); or

3.4.2.3. Architect's or PM’s written interpretation or clarification if authorized and issued as herein provided.

3.4.2.4. Architect's response to an RFI.
ARTICLE 4 – ARCHITECT

4.01 Administration of the Contract

4.1.1. The Architect, in consultation with the PM and as hereinafter limited by Article 5, will provide administration of the Agreement as hereinafter described. However, whenever there is any conflict in the Contract Documents as to whether the Architect or the PM has authority or is responsible for any decision and/or action, the Architect and the PM shall attempt to agree, based upon their respective Contracts with OPS, who, between the Architect and the PM, shall be responsible for such decision and/or action. Any such Agreement shall not be binding on OPS if OPS determines it is not consistent with its Contract with the Architect or the PM.

4.1.2. The Architect and the PM will be OPS's representatives during construction and until final payment is due, and the Architect will continue to be OPS's representative during the warranty period referred to in Paragraph 17.2.2. The Architect will advise and consult with OPS and the PM. OPS's instructions to the Contractor shall be forwarded through either the PM or the Architect, respectively.

4.1.3. The Architect will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of his on-site observations as an Architect, he will keep the PM and OPS informed of the progress of the Work, and will endeavor to guard OPS against defects and deficiencies in the Work of the Contractor.

4.1.4. The Architect will not be responsible for and will not have control or charge of construction means, method, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents, unless Architect knew or reasonably should have known of the failure. The Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work, unless Architect knew or reasonably should have known thereof and could have reasonably taken an action or given a direction which would have avoided the omission or avoided the act. The acts or omissions of the Architect shall not relieve the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work from complying with the Contract Documents, competently and efficiently executing the Work, and performing the Work in accordance with applicable federal, state, and local laws and regulations, nor shall it give rise to any duty or responsibility of the Architect, the PM, and/or OPS to the Contractor, or any Subcontractor, any of their respective agents or employees, or any other person performing any of the Work; or otherwise relieve the Contractor, any Subcontractor, any of their agents or employees from any liability owing to OPS for the acts or omissions of the Contractor, any Subcontractor, or their respective employees and agents.

4.1.5. The Architect, the PM and OPS shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so OPS, the
Architect and PM, or any of them, may perform its or their functions under the Contract Documents.

4.1.6. Based on the Architect's observations and an evaluation of the Contractor's Applications for Payment, the Architect will determine the amounts owing to the Contractor and will issue to the PM Certificates for Payment in such amounts, as herein provided.

4.1.7. The Architect will be the initial interpreter of the requirements of the Contract Documents.

4.1.8. Architect will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as Architect may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents.

4.1.9. Architect may authorize minor variations in the Work from the requirements of the Contract Documents, which do not involve an adjustment in the Contract Price or the Contract Time and are compatible with the Contract Documents and with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OPS and the Contractor who shall perform the Work involved promptly.

4.1.10. Claims, disputes and other matters in question between the Contractor and OPS relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred initially to the Architect for decision which he will render in writing within a reasonable time. The determination of the claim, dispute or other matter by the Architect may be appealed in writing by Contractor, within five (5) days of receiving the Architect’s written determination, to the PM, which shall determine the claim, dispute or other matter within a reasonable time. If not appealed, the Architect's decision will be binding on Contractor. Final resolution of all unresolved claims may be submitted to OPS for decision, which shall be final and binding on Contractor. Neither the Architect or PM shall have any authority to decide claims, disputes or other matters that would involve an increase in the Contract Time or the Contract Price, which may only be determined by OPS.

4.1.11. All interpretations and decisions of the Architect shall be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings.

4.1.12. The Architect’s decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents and if such decisions do not involve a change in the Contract Time or Contract Price.

4.1.13. The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever, in its opinion, or in the opinion of OPS, it is necessary or advisable for the implementation of the Contract Documents, Architect or OPS will have authority to require special inspection or testing of the Work as indicated herein whether or not such Work be then fabricated, installed, or completed. However, neither the Architect's authority to act under this Paragraph 4.1.13, nor any decision made by it in good faith either to exercise or not to exercise such authority, shall relieve the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work from complying with
the Contract Documents, competently and efficiently executing the Work and is in accordance with Laws and Regulations, nor shall it give rise to any duty or responsibility of the Architect, the PM, and/or OPS to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

4.1.14. The Architect will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only to determine if the items covered by the submittals will after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

Architect's review and approval will not extend to means, methods, and techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents). Contractor shall make corrections required by Architect or PM, or both, and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. Both the original review and review of corrected drawings shall be taken with reasonable promptness so as to cause no delay. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.1.15. The Architect will conduct inspections to determine the dates of Substantial Completion and final completion to recommend to OPS for its acceptance, will receive and forward to OPS through the PM for OPS's review, written warranties and related Documents required by the Contract Documents and assembled by the Contractor, and will issue to the PM a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.1.16. With the approval of the PM, the Architect will provide one or more Project representatives to assist the Architect in carrying out his responsibilities at the site. The duties, responsibilities and limitations of authority of any such Project representative shall be as set forth in an exhibit to be incorporated in the Contract Documents. Such Exhibit may be amended, in writing, by the PM and the Architect, with the concurrence of OPS, at any time and from time to time. A copy of any such amendment shall be delivered to the Contractor prior to its taking effect.

4.1.17. The duties, responsibilities and limitations of authority of the Architect and/or the PM, as OPS's representatives during construction, and their respective authority, as set forth in the Contract Documents, will not be changed, modified or extended without the prior written consent of OPS and written notice by the PM to the Architect and Contractor. A copy of any such modification or extension shall be delivered to the Contractor prior to its taking effect.

4.1.18. In case of the termination of the employment of the Architect or any successor Architect, OPS shall appoint a successor Architect. Any successor Architect shall have all the rights, legal obligations, duties and responsibilities set out in the Contract Documents for the original Architect.

4.1.19. Except as herein expressly provided, the Contractor shall not be relieved of his obligation to comply with the Contract Documents, competently and efficiently execute the Work in a good and Workmanlike manner, insure that the Work meets the generally accepted standards for like construction in the Omaha, Nebraska metropolitan area, and is in accordance with Laws and Regulations.
Article 5 - Program Manager

5.1 Administration of the Contract by the Program Manager

5.1.1. The PM shall oversee the administration of the Agreement by the Architect and shall have the necessary and proper authority to undertake the following tasks (the itemization of these tasks are for example and are not by way of limitation):

5.1.1.1. Implement a design and documentation quality control program to establish clarity and consistency of design Documents;

5.1.1.2. Provide technical, constructability and coordination reviews of design documentation for each discipline (to include but not limited to, Architecture, mechanical engineering, electrical engineering, structural engineering, civil engineering and landscape Architecture);

5.1.1.3. Manage construction costs in accordance with Project budgets and, within the guidelines of the Contract Documents, and direct the Contractor and/or Architect with respect to such Project budgets;

5.1.1.4. Assist the Owner, Architect and Contractor, as applicable, with the submission of the appropriate Documents and records to regulatory agencies with jurisdiction over the Project and with the management all required submittals, including:
   a.) Coordination of regulatory agency reviews;
   b.) Controlling regulatory agency approval schedules that impact Project delivery schedules;
   c.) Confirming submittal of Architect and Architect Documents for review by regulatory agencies and resolving potential problems arising from such reviews;

5.1.1.5. coordinate external infrastructure improvements including streets and off-site utility improvements serving the Work that are to be constructed by the City of Omaha or other political subdivisions.

5.1.1.6. provide pre-construction phase management services including:
   a.) Leading pre-construction on-site conferences and providing meeting minutes;
   b.) Approving Contractor's pre-construction checklist;
   c.) Obtaining Contractor's construction schedule, and overseeing the schedule.

5.1.1.7. provide construction phase management services that deliver Projects on time and on or under budget.

5.1.1.8. provide on-going quality, schedule and cost control services throughout the construction phase, including:

5.1.1.8.1. Establishing and implementing a Project management quality assurance and quality control plan for the Work;
5.1.1.8.2. Providing on-site representation and appropriate observation reports;

5.1.1.8.3. Leading regularly scheduled and special on-site progress meetings;

5.1.1.8.4. Providing procedures to minimize requests for Change Orders;

5.1.1.8.5. Controlling Change Order documentation;

5.1.1.8.6. Reviewing, modifying or rejecting Contractor payment applications and submitting payment applications to OPS with recommendations for appropriate payment or other action;

5.1.1.8.7. Providing schedule management and monthly status reports;

5.1.1.8.8. Providing monthly cash flow and Project cost reports.

5.1.1.9. assist in on-going construction site safety management throughout the construction phase for each Project including:

   a.) Reviewing Contractors' safety programs;
   b.) Monitoring and reporting on-site safety program violations;
   c.) Implementing OCIP loss prevention plan if such a program is adopted by OPS.

5.1.1.10. manage timely approvals throughout the construction phase, subject to the direction and responsibility of OPS Assistant Superintendent of Business Services, including, but not limited to:

   a.) Contractor building permit applications;
   b.) Utilities connection and start up approvals.

5.1.1.11. manage the post-construction phase for each Project including:

   a.) Assisting the Architect and OPS in developing the punch list, starting prior to Contractor notice of Substantial Completion, and overseeing the correction of each item;
   b.) Developing and implementing a close out checklist that shall include collection and approval of the Project close-out Documents;
   c.) Submitting as-built (record) drawings or CADD disks and other Documents completed by Contractor.

5.1.1.12. provide warranty management services in cooperation with OPS and the Architect, including:

   a.) Providing pre-warranty date inspections of each Project to develop a list of items to be corrected;
   b.) Managing remedial Work by the Contractor or appropriate Subcontractor(s);
   c.) Documenting warranty Work completed.
5.1.1.13. with the assistance of the Architect, monitor the Contractor’s quality assurance program to guard OPS against defects and deficiencies in the Work of the Contractor. The PM is not authorized to approve or accept any portion of the Work not performed in accordance with the Contract Documents.

5.1.1.14. provide supervision of submittals throughout the Work, including:

a.) Overseeing Shop Drawings reviews and sample approvals, including fixing responsibility for approvals;
b.) Coordinating Contractor payment requests review and approvals.

5.1.1.15. If OPS adopts an Owner Controlled Insurance Program (OCIP) and/or other special programs described herein, provide coordination services with the person or firm designated by OPS, subject to the approval of the General Superintendent for OPS, as follows:

a.) Coordinating of OCIP;
b.) Coordinating of Owner Surety Support program;
c.) Coordinating of Architect’s errors and omissions insurance program.

5.1.1.16. In the event Hazardous Material is discovered at the construction site, at the PM’s sole and absolute discretion, provide the Contractor with a construction sequence plan, or oversee the Contractor’s development of such a sequence plan, in order to minimize schedule impact. If the PM elects to provide such a plan to the Contractor, the Contractor must follow such plan. The PM is not required to provide any such plan or to oversee the development of such a plan by the Contractor. The development or failure to develop any such plan by the PM, or the development of such a plan by the Contractor, shall not absolve the Contractor from his responsibilities set out in the Contract Documents or from completing the Work within the time limits stated in the Contract Documents. The PM and PM’s consultants shall not be responsible for the discovery, presence, handling, removal, or disposal of or exposure of persons to Hazardous Materials in any form at any Project site, including, but not limited to, asbestos, asbestos products, polychlorinated biphenyl (PCB) or other toxic substances. In the event the Architect, PM or Contractor encounters on the construction site material reasonably believed to be asbestos, PCB or any other Hazardous Material which has not been rendered harmless, the PM shall immediately report the condition to OPS in writing.

5.1.1.17. in general, to act as OPS’s representative to and with the Architect and Contractor to complete the Work.

5.2 Instructions to Others And Exchange of Information

5.2.1. PM has the right to communicate with, exchange information with, and issue instructions to, the Architect and/or Contractor, with the understanding that such communications are not to interfere with or hinder the performance of duties assigned to the Architect.

5.3 Conflicts Between Architect and Program Manager

5.3.1. Whenever there is any conflict in the Contract Documents as to whether the Architect or the PM has authority or is responsible for any decision and/or action, the Architect and the PM
shall attempt to agree, based on their respective Contracts with OPS, who, between the Architect and the PM, shall be responsible for such decision and/or action. Any such Agreement shall not be binding on OPS if OPS determines it is not consistent with its Contracts with the Architect or PM.

5.4 **Visits To Site**

5.4.1. The PM will visit the site at intervals appropriate to the stage of construction to observe as an experienced and qualified construction Program Manager the progress that has been made and the quality of the various aspects of Contractor’s executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. PM's efforts will be directed toward providing for OPS a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of its on-site observations as Program Manager, it will keep OPS informed of the progress of the Work, and will endeavor to guard OPS against defects and deficiencies in the Work of the Architect or Contractor, or both.

5.5 **PM's Overall Authority to Oversee Safety Programs, Manage Compliance with the Contract Documents and Protect the Interests of OPS.**

5.5.1. The Contractor is responsible for carrying out the instructions of the PM, with respect to all safety precautions and programs that may be instituted by OPS.

5.5.2. The PM has the authority to reject Work, which does not conform to the Contract Documents. Whenever, in its opinion, it considers it necessary or advisable for the implementation of the Contract Documents, it may, with the concurrence of OPS, require special inspection or testing of the Work whether or not such Work be then fabricated, installed, or completed. OPS will pay for any such special inspection or testing, unless the results reveal defective Work. However, neither the PM's authority to act under this Subparagraph 5.5.2, nor any decision made by it in good faith either to exercise or not to exercise such authority, shall relieve the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work from complying with the Contract Documents, competently and efficiently executing the Work in a good and Workmanlike manner, insuring that the Work meets the generally-accepted standards for like construction in the Omaha, Nebraska metropolitan area and is in accordance with applicable federal, state, and local laws and regulations, nor shall it give rise to any duty or responsibility of the Architect, the PM, and/or OPS to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

5.5.3. The PM will consult with the Architect upon Contractor’s submittals such as Shop Drawings, Product Data and Samples. Such consultation shall be taken with reasonable promptness so as to cause no delay.

5.6 **Approval and Submission to OPS of Applications for Payment**

5.6.1. Based on the PM's observations and an evaluation of the Contractor's Applications for Payment as submitted to the Architect, the PM will determine the amounts owing to the Contractor and will forward the Architect’s Certificates for Payment to OPS for review and approval in such amounts and with such recommendations as it deems appropriate.
5.7 **Inspections and Substantial Completion**

5.7.1. The PM will conduct inspections to determine the dates of Substantial Completion and final completion to recommend to OPS for acceptance of these dates, will receive from the Architect and forward to OPS for OPS's review written warranties and related Documents (as-built drawings, Project specifications, operation and maintenance manuals, etc.) required by the Contract Documents and assembled by the Contractor, and will approve and forward to OPS for appropriate action a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

5.8 **Resident Project Representative**

5.8.1. If PM furnishes a Resident Project Representative to assist PM in providing more continuous observation of the Work, the RPR shall have the same responsibilities and authority, and limitations thereon, as established for the PM in this Article 5, unless the PM notifies the Architect and Contractor, in writing, to the contrary.

5.9 **Appointment of Successor PM**

5.9.1. In case of the termination of the employment of the Program Manager, OPS may, but is not required to, appoint a new or successor Program Manager. If OPS dismisses the PM and elects not to appoint a successor, or elects to postpone the appointment of a successor, the rights and responsibilities of the PM shall accrue to OPS, and OPS shall have the right to allocated such rights and responsibilities, from time to time, and at any time, in its sole and absolute discretion, between it and the Architect. Whenever OPS assigns any of the rights and responsibilities of the PM to the Architect, it shall notify the Architect and the Contractor in writing. The Contractor shall have a right to rely upon any such written notification by OPS.

**ARTICLE 6 – OPS**

6.1 **Information and Services Required of OPS**

6.1.1. OPS will furnish the site as shown in the Contract Drawings and will make payments as provided in the Contract Documents.

6.1.2. OPS shall furnish as indicated in the Contract Documents rights-of-way and easements for access to the site, and such other lands, other than City of Omaha rights-of-way, which are designated for, use in the Contract Documents. Any construction that is to take place in City of Omaha rights-of-way shall be coordinated by Contractor with the City. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

6.1.3. OPS shall furnish all surveys describing the physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.
6.1.4. Except as otherwise provided in the Contract Documents, OPS shall secure and pay for
necessary approvals, easements, assessments and charges required for the construction,
use or occupancy of permanent structures or permanent changes in existing facilities.

6.1.5. Information under OPS’s control shall be furnished by OPS with reasonable promptness to
avoid delay in the orderly progress of the Work.

6.1.6. OPS shall forward all instructions to the Contractor through the PM, the Architect, or both.

6.1.7. The foregoing is in addition to other duties and responsibilities of OPS enumerated in the
Contract Documents, including those pertaining to Work by OPS or by separate Contractor
of OPS, payments and completion, and insurance as herein set out.

6.2 **OPS’s Right to Reject Work**

6.2.1. OPS has the authority, without the concurrence of Architect or PM, to reject any Work that
is Defective.

6.3 **OPS’s Right to Stop the Work**

6.3.1. If the Contractor fails to correct Defective Work as required by the Contract Documents or
persistently fails to carry out the Work in accordance with the Contract Documents, OPS, by
a written order signed by an agent of OPS so empowered by OPS in writing or in the
Contract Documents, by any one of its legal counsel, or by the PM, may order the
Contractor to stop the Work, or any portion thereof, until the cause for such order has been
eliminated. The right of OPS to stop the Work shall not give rise to any duty on the part of
OPS to exercise this right for the benefit of the Contractor or any other person or entity.

6.4 **OPS’s Right to Carry Out the Work**

6.4.1. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract
Documents and fails within seven (7) days after receipt of written notice from the PM on
behalf of OPS, or from OPS, to commence and continue correction of such default or neglect
with diligence and promptness, OPS may, without prejudice to any other remedy it may
have, make good such deficiencies. In such a case an appropriate Change Order shall be
issued deducting from the payments then or thereafter due the Contractor the cost of
correcting such deficiencies, including compensation for the Architect’s and PM’s additional
services made necessary by such default, neglect or failure. The amount charged to the
Contractor is subject to the prior approval of the Architect. If the payments then or thereafter
due the Contractor are not sufficient to cover such amount, the Contractor shall pay the
difference to OPS.
7.1 Data Regarding Subsurface and Physical Conditions:

7.1.1. Reference is made to the Supplementary Conditions for identification of:

7.1.1.1. subsurface conditions (those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by the Architect in preparing the Contract Documents); and

7.1.1.2. physical conditions (those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to a site (except Underground Facilities) that have been utilized by Architect in preparing the Contract Documents).

7.1.1.3. Other than as shown or specifically stated in the Supplemental Conditions, Architect, OPS and PM have no special knowledge of any physical item in or relating to existing surface or subsurface conditions which will affect the Work. However, in any event, Contractor shall be responsible for ascertaining adequate technical information before the commencement of the Work regarding any existing surface or subsurface condition.

7.1.2. Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings referred to in Paragraphs 7.1.1.1 and 7.1.1.2, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against OPS, Architect, PM or any of their consultants with respect to:

7.1.2.1. the completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

7.1.2.2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

7.1.2.3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

7.2 Notice of Differing Subsurface or Physical Conditions.

7.2.1. If Contractor believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed in the performance of the Work either:

7.2.1.1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraphs 7.1.1 and 7.1.2 is materially inaccurate, or

7.2.1.2. differs materially from that shown or indicated in the Contract Documents, or
7.2.1.3. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents; then Contractor shall promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by Paragraph 14.3), notify PM and Architect in writing about such condition. Contractor shall not further disturb such conditions or perform any Work in connection therewith (except as herein provided) until receipt of a written order to do so from the Architect. Failure of Contractor to notify PM and Architect as required herein shall be deemed a waiver by Contractor of any claim for extension of Contract Time or Contract Price by reason of such differing conditions.

7.3 Architect's Review of Contract Documents and Technical Data:

7.3.1. Upon receipt of the notice referred to in Section 7.2, Architect will promptly review the pertinent conditions, determine the necessity of OPS's obtaining additional exploration or tests with respect thereto and advise PM in writing (with a copy to Contractor and to OPS) of Architect's findings and conclusions.

7.4 Possible Contract Documents Change

7.4.1. If the Architect concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in Paragraph 7.2.1, or, if applicable, Paragraph 7.6.2, the recommendation for the change shall be submitted to the PM for consideration. If the PM agrees with the conclusion of the Architect, the recommendation shall be submitted to the OPS Board of Education, along with a proposed Work Change Directive or a proposed Change Order, and the Board's action thereon shall be final and binding on Contractor. The OPS Board of Education, in its sole and absolute discretion, may elect to repair the condition itself or by utilizing the services of another Contractor, cancel this Agreement, authorize the change in the Contract Documents and allow the Contractor to complete the Work, or take such other action as it deems desirable and appropriate under the circumstances. Any change approved by the Board of Education will not entitle Contractor to any increase in the Contract Price or extension of the Contract Time unless expressly approved by the Board of Education as provided in Paragraph 7.5.

7.5 Possible Price and Times Adjustments

7.5.1. If the Contractor wishes to make an equitable claim for an increase in the Contract Price or for extra costs or damages due to a condition that meets one or more of the categories in Paragraph 7.2.1, or, if applicable, Paragraph 7.6.2, he shall give the Architect, PM and OPS written notice thereof within ten (10) days after the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with the provisions herein set forth regarding emergency conditions. Such claim, with the recommendations of the Architect and the PM, will be submitted to the OPS Board of Education and its action shall be final and binding on Contractor. Failure of Contractor to give such notice within the ten (10) day period shall be a waiver by Contractor of any such claim and such claim or possible claim shall be invalid and unenforceable. Compliance by the Contractor with this paragraph does not validate any claim otherwise invalid. The Board of Education shall not consider any increase in the Contract Price or in the Contract Time...
unless such condition must be included in one or more of the categories described in Subparagraphs 7.2.1.1 through 7.2.1.3 inclusive, or, if applicable, Paragraph 7.6.2. Notwithstanding the foregoing, in no event shall Contractor be entitled to any adjustment in the Contract Price or Contract Time if:

7.5.1.1. Contractor knew of the existence of such conditions at the time Contractor submitted its bid for the Project;

7.5.1.2. The existence of such condition could reasonably have been discovered or revealed prior to the time Contractor submitted its bid as a result of any reasonable examination, test, investigation, exploration, or study of the site and contiguous areas required by the Bidding Documents or Contract Documents to be conducted by or for the Contractor;

7.5.1.3. Contractor failed to give the written notice within the time as required in Paragraph 7.2.1; or

7.5.1.4. The concealed conditions encountered in the performance of the Work below the surface of the ground or the concealed conditions or unknown conditions in an existing structure do not differ materially from those ordinarily encountered and generally recognized as inherent in Work of the character and nature provided for in the Contract Documents.

7.5.2. Any such adjustment in the Contract Price or Contract Time by the Board of Education, shall be at the sole and uncontrolled discretion of the Board of Education and its decision(s) shall be final and binding. OPS shall be liable to the Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with this or any other Project or Work or anticipated Project or Work caused by unforeseen or concealed conditions or for any other reason for which an adjustment has been made.

7.6 Physical Conditions - Underground Facilities:

7.6.1. The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OPS or Architect by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

7.6.1.1. OPS, the PM and the Architect, either jointly or severally, shall not be responsible for the accuracy or completeness of any such information or data; and

7.6.1.2. The cost of all of the following will be included in the Contract Price and Contractor shall have full responsibility for (i) reviewing and checking all such information and data, (ii) locating at the site all Underground Facilities shown or indicated in the Contract Documents prior to commencement of any Work, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided herein and repairing any damage thereto resulting from the Work

7.6.2. If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions
affected thereby or performing any Work in connection therewith (except in an emergency as hereinafter required), identify the owner of such Underground Facility and give written notice to the owner of the Underground Facility, OPS, the Architect and PM. Architect, in consultation with the PM, will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If Architect concludes that a change in the Contract Documents is required as a result of the Underground Facility, the recommendation for the change shall be submitted by Architect and PM to the Board of Education, along with a proposed Work Change Directive or a proposed Change Order, and the Board’s action thereon shall be final and binding on Contractor. The Board of Education, in its sole and absolute discretion, may elect to repair the condition itself or by utilizing the services of another Contractor, cancel the Agreement, authorize the change in the Contract Documents and allow the Contractor to complete the Work, or take such other action as it deems desirable and appropriate under the circumstances. During such time Contractor shall be responsible for the safety and protection of such Underground Facility as herein provided. If Contractor wishes to make a claim for an increase in the Contract Price, or for an extension of the Contract Time, or both, based upon the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that Contractor was unaware of and could not reasonably have been expected to be aware of or to have anticipated, Contractor shall give Architect, the PM and OPS written notice thereof within ten (10) days after the event giving rise to such claim. If the Contractor makes a claim for an increase in the Contract Price or for extra costs or for damages, or for an extension of Contract Time, or for two or more such items, such claim shall be treated as a request for an equitable adjustment and controlled by the provisions contained in Paragraph 7.5. Failure to give such notice within the ten-day period shall be a waiver by Contractor of any such claim, and such claim shall be null and void. Regardless of whether any Underground Facility is shown in the Contract Documents, Contractor shall be responsible for any and all loss or damage to such Underground Facilities caused by Contractor, any Subcontractor or anyone for whose acts either of them are responsible.

7.7 Reference Points

7.7.1. OPS shall provide engineering and/or Architectural surveys to establish references to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established property boundary markers and shall make no changes or relocations without the prior written approval of the Architect and PM. Contractor shall report to Architect whenever any such reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and Contractor shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified engineering personnel.

7.8 Hazardous Materials

7.8.1. OPS shall be responsible for the removal or abatement of any Hazardous Materials uncovered or revealed at the site which are not identified in the Contract Documents to be within the scope of the Work to be performed by Contractor and which are required by applicable law to be removed or abated, or which may present a substantial danger to persons or properly exposed thereto in connection with the Work at the site. All such removal
and abatement will be performed in accordance with all applicable governmental laws, regulations, and ordinances governing the same. OPS shall not be responsible for the removal or abatement of any Hazardous Materials brought to the site by Contractor, any Subcontractor or Supplier or anyone else for whom Contractor is responsible, which Hazardous Materials shall be removed or abated by Contractor.

7.8.2. Should any Hazardous Materials be found, uncovered or revealed at the site which were not shown or indicated in Drawings or Specifications or identified in the Contract Documents, Contractor shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency), and (ii) orally notify OPS, Architect and PM (and thereafter confirm such notice in writing). OPS shall promptly consult with Architect and PM concerning the necessity for OPS to retain a qualified expert to evaluate such hazardous condition and/or take any corrective action as set forth in Section 7.8.1. Contractor shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OPS has obtained any required permits related thereto and delivered to Contractor special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of the Work, or (ii) specifying any special conditions under which such Work may be resumed safely.

7.8.3. If after receipt of such special written notice Contractor does not agree to resume such Work after the affected area has been rendered safe for the resumption of the Work, or refuses, without cause, to resume such Work under such special conditions, then OPS may elect to treat such failure or refusal as a default under the Contract Documents and Owner shall have all rights and remedies allowed to Owner upon default by Contractor as set forth in Section 18.2 of the General Conditions.

7.8.4. OPS agrees to indemnify and defend at its cost, by counsel selected by OPS, Contractor and Contractor’s surety on any bond furnished by Contractor for the Work, and their respective employees, agents, Contractors, successors and assigns, for any fine and for any alleged or actual loss, damage, claim, or expense for property damage and bodily injury, including any remediation, abatement and clean-up costs arising from the presence, release or threat of release of any Hazardous Materials either from the site upon which the Work is to be performed or from any materials that Contractor removes from the site at the direction of the Owner or PM. This indemnity shall not apply in the event:

7.8.4.1 The Hazardous Materials were brought onto the site by the Contractor, any Subcontractor or Supplier or anyone for whose acts Contractor is responsible.

7.8.4.2 Contractor, any Subcontractor or Supplier, or anyone for whose acts Contractor is responsible, fails or refuses to comply with any order or directive by Owner, PM or any governmental authority to cease Work because of the presence of Hazardous Materials at the site or to comply with any special conditions for the performance of any Work on the site.

7.8.4.3 Any fine, loss, damage, claim or expense arising from any removal or abatement activities of Hazardous Materials from the site by Contractor where the Contractor has actually been engaged by OPS to perform such removal or abatement activities.
Article 8 – Contractor

8.1 Supervision and Construction Procedures

8.1.1. The Contractor shall supervise, inspect and direct the Work competently and efficiently, using his best skill and attention, and applying such skills and expertise as is necessary to perform the Work in accordance with the Contract Documents. Except as otherwise expressly limited in the Contract Documents, the Contractor shall be solely responsible for all construction means, methods, techniques, and procedures and for coordinating all portions of the Work under the Contract Documents. The Contractor shall be solely responsible for all locations, dimensions and levels, and no instructions or orders received from any source, or contained in the Drawings and Specifications or in written orders of the Architect and/or the PM, or both, shall justify departure from the requirements of the Contract Documents. Contractor shall take his own measurements at the site, verifying same with the Drawings and at the building, and will be responsible for the proper fit of completed Work in position. Contractor shall insure that the completed Work complies accurately and fully with the Contract Documents.

8.1.2. The Contractor shall be responsible to OPS for the acts and omissions of its employees, agents, Subcontractors and their agents and employees, and for all other persons performing any of the Work.

8.1.3. The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Architect and/or PM in the administration of the Agreement, or by any inspections, tests or approvals required to be performed or performed by persons other than the Contractor. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data, or Samples for such portion of the Work.

8.1.4. Before ordering any material or doing any Work, the Contractor shall comply with the provisions in Subparagraphs 2.4.2.1 through 2.4.2.3, inclusive, set forth above.

8.1.5. The Contractor shall be responsible for laying out the Work, setting lines and grades.

8.2 Labor and Materials

8.2.1. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, appliances, construction equipment and machinery, water, heat, utilities, fuel, power, light, telephone, sanitary facilities, transportation, and other facilities, incidentals, and services and labor, necessary for the proper furnishing, execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

8.2.2. The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. Contractor shall at all times maintain good discipline and order at the site. OPS prohibits the illegal use of drugs, the possession of permitted and/or non-permitted firearms, the consumption of alcoholic beverages, and the presence of any person under the
influence of drugs, including alcohol, on and within the limits of the School District’s property. The Contractor agrees to take all necessary steps to ensure that each agent and employee of the Contractor and each subcontractor complies with this prohibition.

8.2.3. Smoking shall not be permitted inside any building located on OPS property, regardless of whether any construction activities are occurring in such building. No smoking will be permitted on any OPS property.

8.3 Warranties and Guarantees

8.3.1. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents, and all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier, except as otherwise provided in the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered Defective. If required by the Architect or PM, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment

8.3.1.1. All warranties and guarantees specifically called for by the Specifications or Contract Documents shall expressly run to the benefit of OPS.

8.3.1.2. Contractor shall provide the PM with copies of all guarantees or warranties which have been made to the Contractor by suppliers or subcontractors, as required hereunder, together with an assignment of such warranties and guarantees to OPS; however, such assignments shall not relieve the Contractor of the responsibility hereinafter set forth in Subparagraph 8.3.1.3 in case of failure of such warranties or guarantees nor does it relieve the Contractor of any of Contractor’s liabilities and responsibilities established by the Contract Documents.

8.3.1.3. Contractor hereby guarantees that all of the Work performed under the Contract Documents will be free from faulty materials in every particular, and will be free from improper Workmanship. Contractor agrees to promptly replace or re-execute without cost to OPS any such Work as may be found to be Defective, or otherwise improper, imperfect, faulty or of unsatisfactory material and/or Workmanship, without cost to OPS, and to make good all damage caused to other Work or materials, or to OPS’s property, real and personal, due to such Defective, improper, imperfect, faulty or unsatisfactory material and/or Workmanship, and/or due to the required replacement or re-execution thereof. This guarantee shall be for a period of one (1) year from the date of Substantial Completion as certified by the Architect under the Contract Documents and approved by the Board of Education. This guarantee must be furnished to OPS and approved by it before acceptance and final payment is made.

8.3.2. Contractor’s obligations to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance by OPS, the Architect or PM of Work that is not in accordance with the Contract Documents or constitute a release of Contractor’s obligations under the written guarantee:

8.3.2.1. observations by Architect or PM, or both;
8.3.2.2. recommendation of any progress or final payment by either PM or Architect, or both;

8.3.2.3. the issuance of a Certificate of Substantial Completion or any progress payment or final payment by OPS to Contractor under the Contract Documents;

8.3.2.4. use or occupancy of the Work or any part thereof by OPS;

8.3.2.5. any acceptance of any portion of the Work by OPS or any failure to do so;

8.3.2.6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Architect, PM or OPS, or any one or more of them.

8.3.2.7. any inspection, test or approval by others; or

8.3.2.8. any correction of defective Work by OPS or any other Contractor on behalf of OPS.

8.3.3. Neither the Final Certificate, final acceptance, nor any payment, nor any provision in the Contract Documents shall relieve the Contractor of responsibility for Defective, improper, imperfect, negligent, faulty or unsatisfactory materials or Workmanship during the period covered by the guarantee.

8.4 Taxes

8.4.1. The Contractor shall be held to have studied all tax laws for the State of Nebraska, the County of Douglas, Nebraska and the City of Omaha, Nebraska, and shall pay before delinquency all taxes for which Contractor is obligated to pay by applicable Laws and Regulations.

8.4.2. The Omaha Public Schools is an exempt from sales and use tax under Nebraska law. OPS will appoint Contractor as its purchasing agent for purposes of obtaining materials to be incorporated into the Project without payment of sales or use taxes. Contractor shall be responsible for and shall pay all sales and use taxes on any materials, supplies, equipment, and other tangible personal property used or consumed by the Contractor in performing the Agreement but which are not incorporated into the Project. Contractor represents that no sales or use taxes were included in Contractor’s bid for materials incorporated into the Project.

8.4.3. Where Federal Laws and Regulations exempt OPS from the payment of excise or manufacturer’s taxes on materials or equipment, the Contractor shall have excluded from Contractor’s bid and from the Contract Price the amount of any applicable Federal Excise or manufacturer taxes. OPS will furnish the Contractor, on request by the Contractor, the necessary exemption certificates to aid the Contractor in the recovery of any such Federal taxes paid by the Contractor for materials and equipment built into the structures of the Project or to support the Contractor’s failure to pay such taxes, as the case may be.
8.5 Permits, Fees and Notices

8.5.1. The Contractor shall secure and pay for the building permit(s) and for all other permits and governmental fees, licenses and inspections necessary for the execution and completion of the Work and which are legally required at the time the bids are received. OPS will not reimburse Contractor permit or inspection fees.

8.5.2. The Contractor shall give all notices and comply with all Laws and Regulations and lawful orders of any public authority bearing on the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OPS, PM nor Architect shall be responsible for monitoring Contractor’s compliance with any such Laws and Regulations and lawful orders.

8.5.3. It is not the responsibility of the Contractor to make certain that the Specifications and Drawings have been prepared in accordance with applicable Laws and Regulations. However, if the Contractor observes that any of the Contract Documents are at variance therewith in any respect, Contractor shall promptly notify the Architect, in writing, and any necessary changes shall be accomplished by appropriate Modification, Change Order or Field Order.

8.5.4. If the Contractor performs any Work knowing or having reason to believe that it is contrary to any Laws and Regulations and without such notice to the Architect in accordance with Paragraph 8.5.3, Contractor shall assume full responsibility therefor and shall bear all costs, claims, losses, and damages attributable thereto.

8.6 General Supervisor

8.6.1. The Contractor shall employ a competent general Superintendent (which term is synonymous with foreman or forewoman, or supervisor and all such terms are herein defined to mean Contractor’s general Superintendent of the Project and hereinafter collectively referred to as “Supervisor”) and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The Supervisor shall be satisfactory to the PM and OPS, and shall not be changed except with written consent of the PM and OPS, unless the Supervisor proves to be unsatisfactory to the Contractor and ceases to be in his employ or under extraordinary circumstances. Any replacement Supervisor shall be approved by the PM and OPS.

8.6.2. The Supervisor shall represent the Contractor and all communications given to the Supervisor shall be as binding as if given to the Contractor. Important communications given by either the PM or the Architect to the Supervisor shall be confirmed in writing. Other communications shall be so confirmed on written request in each case. No oral communication may be given to the PM or the Architect for transmittal to OPS.

8.7 Progress Schedule

8.7.1. The progress schedule hereinbefore required by Paragraphs 2.4.4 and 2.4.5 shall provide for expeditious execution of the Work and shall conform to any order or sequence of the Work specified elsewhere in the Contract Documents. The progress schedule shall be related to
the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

8.7.2. Contractor shall adhere to the progress schedule established in accordance with Paragraphs 2.4.4 and 2.4.5 as it may be adjusted from time to time as provided below:

8.7.2.1. Contractor shall submit to PM for acceptance (to the extent indicated in Paragraphs 2.4.4 and 2.4.5) proposed adjustments in the progress schedule that will not change the Contract Time (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

8.7.2.2. Proposed adjustments in the progress schedule that will change the Contract Time (or Milestones) shall be submitted as required by these General Conditions. Such adjustments may only be made by a Change Order or Written Amendment in accordance with the Contract Documents.

8.8 Documents and Samples at the Site

8.8.1. The Contractor shall maintain at the site for OPS one annotated copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Project Data and Samples. These shall be available to the Architect, PM and OPS and shall be delivered to the PM for OPS upon completion of the Work.

8.9 Shop Drawings, Product Data and Samples

8.9.1. The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work, or in the Work of OPS or any separate Contractor, but in no event later than set out in the accepted schedule of Shop Drawings submitted as herein required, all Shop Drawings, Product Data and Samples required by the Contract Documents.

8.9.1.1. Each submittal will bear specific written statement by the Contractor affirming that Contractor has satisfied Contractor's obligations under the Contact Documents with respect to Contractor's review and approval of that submittal.

8.9.1.2. At the time of each submission Contractor shall give Architect specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication, shall cause a written annotation to be made on each Shop Drawing and Sample submitted to Architect for review and approval of each such variation.

8.9.2. By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that it has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the
information contained within such submittals with the requirements of the Work and of the Contract Documents.

8.9.3. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of Shop Drawing, Product Data or Samples unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's approval thereof.

8.9.4. Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Architect on previous submittals.

8.9.5. No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Architect as provided in Subparagraph 4.1.14. All such portions of the Work shall be in accordance with such approved submittals.

8.9.6. Architect will review and approve Shop Drawings, Product Data and Samples in accordance with the schedule of Shop Drawings, Product Data and Sample submittals accepted by Architect as hereinbefore required. Architect's review and approval will be only to determine if the items covered by the submittals will after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Architect's review and approval will not extend to means, methods, and techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents). The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make corrections required by Architect, and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Architect on previous submittals.

8.9.7. Where a Shop Drawing, Product Data or Sample is required by the Contract Documents or the schedule of Shop Drawings, Product Data and Sample submissions accepted by Architect, any related Work performed prior to Architect's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

8.10 **Substitutes and/or “Equal” Items**

8.10.1. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by Architect and OPS under the following circumstances:
8.10.1.1. If in OPS’s sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by OPS as an "or-equal" item, in which case review and approval of the proposed item may, in OPS’s sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

8.10.1.2. If in OPS’s sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under the Contract Documents, it will be considered a proposed substitute item. Contractor shall submit sufficient information as provided below to allow Architect to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. The procedure for review by the Architect will include the following as supplemented in the General Requirements and as Architect may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by Architect from anyone other than Contractor. If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall first make written application to Architect for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice Contractor’s achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct Contract with OPS for Work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other Contractors affected by the resulting change, all of which will be considered by Architect in evaluating the proposed substitute. Architect or OPS may require Contractor to furnish additional data about the proposed substitute.

8.10.2. All data to be provided by Contractor in support of any proposed "or-equal" or substitute item will be at Contractor’s expense.

8.10.3. If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to Architect and OPS. Contractor shall submit sufficient information to allow Architect and OPS, in their sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by Architect will be similar to that provided in Subparagraph 8.10.1.2.

8.10.4. Architect will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 8.10.1.2 and 8.10.3 and make recommendations to
OPS. OPS will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without OPS’s prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. PM or OPS may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. Architect and/or PM will record time required by Architect, PM and their consultants in evaluating substitutes proposed or submitted by Contractor pursuant to Paragraphs 8.10.1.2 and 8.10.3 and in making changes in the Contract Documents (or in the provisions of any other direct Contract with OPS for Work on the Project) occasioned thereby. Whether or not OPS accepts a substitute item so proposed or submitted by Contractor, Contractor shall reimburse OPS for the charges of Architect, PM and/or their Consultants for evaluating each such proposed substitute item.

8.11 Use of Site and Clean-Up

8.11.1. The Contractor shall confine operations and the Work at the site, including, but not by way of limitation, storage of construction equipment and materials, use of equipment and the operation of Workers and labors, to areas permitted by Laws and Regulations, ordinances, permits and the Contract Documents and other land and areas permitted by rights-of-way, permits and easements, and shall not unreasonably encumber the site with any materials or equipment. No materials shall be stored nor shall equipment be parked on adjacent property without the express written consent of OPS and without the permission of the owner of such property if the owner is not OPS. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas resulting from the performance of the Work. Should any claim be made by such owner or occupant because of the performance of the Work or the use of such property, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. Contractor shall, to the fullest extent permitted by Laws or Regulations indemnify and hold harmless OPS, Architect and PM, or any one or more of them, their consultants and agents and anyone directly or indirectly employed by any of them from and against all judgments, claims, losses, costs, and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OPS, Architect, PM or any other party indemnified hereunder to the extent caused by or based upon Contractor’s performance of the Work, or use of such property.

8.11.2. During the progress of the Work, Contractor shall keep the site free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. Contractor shall leave the site clean and ready for occupancy by OPS at Substantial Completion of the Work. Contractor shall restore to original condition all property not designated for alteration by the Contract Documents and shall clean all glass surfaces and leave the Work "Broom-clean" or its equivalent, except as otherwise specified.

8.11.3. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent properly to stresses or pressures that will endanger it. Any material, which has deteriorated, become damaged, or otherwise unfit for use, in whole or in part, shall not be used in the Work.
8.11.4. If applicable, OPS will provide to the Contractor access to the required Work areas in existing buildings. Such access shall be according to the mutual Agreement between the Contractor and the building manager or principal. Suitable storage facilities may be arranged with the principal or manager of such building for materials liable to damage from exposure to the weather. However, the refusal of any principal or manager to allow materials to be stored at or near his or her building shall not increase OPS’s liability for damage to such material. OPS shall not be responsible for the property and material stored in or near existing buildings as an accommodation to the Contractor.

8.11.5. If the site upon which the Work is to be performed is being used for school or other uses authorized by OPS, Contractor shall take all reasonable measures to minimize any disruption to those activities and uses. If applicable, the Contractor shall request from the building principal Contractor’s requirements for special areas so as to allow the principal to schedule the affected areas for both construction and normal activities during the construction period. The building principal will cooperate with the Contractor in making the requested special areas available for special periods of time.

8.11.6. It shall be the responsibility of the Contractor, through his general supervisor, to see that the debris and trash resulting from construction operations, whether caused by the Contractor, or by any Sub-Contractor, or supplier, agent, employee, laborer, or Workman or Workwoman, of the Contractor or any Sub-Contractor, or by any other person under the control, either directly or indirectly, of the Contractor, are removed from the property from time to time as the Work progresses or as directed by Architect, PM or OPS.

8.11.7. If the Contractor fails to clean up during or at the completion of the Work, OPS may do so as herein provided and the cost thereof shall be charged to the Contractor, and may be deducted from any amounts owed Contractor.

8.12 Cutting and Patching of Work

8.12.1. The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

8.12.2. The Contractor shall not damage or endanger any portion of the Work or the Work of OPS or any separate Contractors by cutting, patching or otherwise altering any Work, or by excavation. The Contractor shall not cut or otherwise alter the Work of OPS or any separate Contractor except with the written consent of OPS and of such separate Contractor. The Contractor shall not unreasonably withhold from OPS or any separate Contractor his consent to cutting or otherwise altering the Work.

8.13 Communications

8.13.1. The Contractor shall forward all communications directed to OPS, in writing, through the, PM with a copy being delivered to the Architect.
8.14 Royalties and Patents

8.14.1. The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any copyrights and patent rights and shall save OPS harmless from loss on account thereof except that Contractor shall not be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufactures is specified, but if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, Contractor shall be responsible for such loss unless Contractor promptly gives such information to the Architect.

8.15 Indemnification

8.15.1. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless OPS, PM and Architect and their agents and employees from and against all claims, damages, losses, and expenses, including, but not limited to, attorneys’ fees and costs, arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than to Work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any act or omission, negligent or otherwise, of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 8.15.

8.15.2. In any and all claims against OPS, the PM or the Architect or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 8.15 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workers’ or Workmen’s compensation acts, disability benefit act or other employee benefit acts.

8.15.3. The obligations of the Contractor under this Paragraph 8.15 shall not extend to the liability of the Architect, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving, or the failure to give directions or instructions by the PM or Architect, or both, or their agents, or employees provided such giving or failure to give is the primary cause of the injury or damage.

8.16 Civil Rights

8.16.1 Contractor agrees that Contractor and all Subcontractors will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) as amended and all requirements imposed by or pursuant to the Regulations of the Department of Education (34 C.F.R. Part 100) issued pursuant to that title, to the end that, in accordance with Title VI of the Act and the Regulation, no person in the United States shall, on the grounds of race, color, or natural origin, be excluded from
participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which OPS receives Federal financial assistance from the Department; and hereby gives assurance that Contractor will immediately take any measures necessary to effectuate the provisions this paragraph. Contractor further agrees that Contractor and all Subcontractors will comply with all applicable requirements of Laws and Regulations pertaining nondiscrimination in employment.

8.16.2 Contractor shall have, and shall maintain during the term of the Agreement, a demonstrated equal employment opportunity record. In subcontracting Work for the Project, Contractor shall consider a potential subcontractor’s demonstrated equal opportunity record.

8.17 Employees

8.17.1 Contractor must register with and utilize an electronic verification system or program, whether the Work authorization program of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, now known as the “E-Verify Program” or an equivalent federal program designated by the Department of Homeland Security or other federal agency authorized to verify the Work eligibility status of any newly hired employee pursuant to the Immigration Reform and Control Act of 1986. Contractor shall Contractually require all subcontractors and consultants performing any portion of the Contractor's Work under the Contract Documents to also register and utilize such electronic verification system. Contractor and all of Contractor's subcontractors and consultants shall use such electronic verification system to determine the Work eligibility status of each new employee physically performing any services within the State of Nebraska under the Contract Documents. Any person whom the electronic verification system determines is ineligible or not authorized to Work in the United States shall not be permitted by Contractor, nor any subcontractor or consultant, to perform services in Nebraska under the Contract Documents. Contractor shall provide such reasonable documentation as Owner may request, from time to time, during the performance of the Work under the Contract Documents and for 5 years thereafter documenting compliance with the provisions of this Section 8.17.1. Failure to comply with the provisions of this Section shall constitute a default under the Contractor's Agreement with the Owner.

8.17.2 Contractor and each subcontractor of Contractor must complete criminal record checks on all employees who Work on the Project and who will be visiting the Project site during the course of the performance of the Work under the Contract Documents. The requirement to conduct such checks is a continuing requirement to be performed during the entire time that Contractor is performing services under the Contract Documents for any employee of Contractor and any Subcontractor that is to visit the Project Site. Employees of Contractor, or of any Subcontractor, who have been convicted of a violent or serious felony, including crimes that require registration on the National Sexual Offender Registry or on an abuse/neglect registry, will not be allowed to visit the Project Site. The Contractor must complete the Owner’s Criminal Records Check Certification and furnish it to Owner and PM. The Contractor and each subcontractor shall adhere to all Federal, State, or Local privacy and confidentiality regulations and laws.
Article 9 – Subcontractors

9.1 Award of Subcontracts and Other Contracts for Portions of the Work

9.1.1. As soon as practicable after the award of the Agreement, Contractor shall furnish to the PM and the Architect in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not OPS, the PM or the Architect, after due investigation, has reasonable objection to any such proposed person or entity.

9.1.2. The Contractor shall not Contract with any such proposed person or entity to whom OPS or the PM has made reasonable objection under the provisions of Subparagraph 9.1.1. The Contractor shall not be required to Contract with anyone to whom Contractor has a reasonable objection.

9.1.3. If OPS or the PM has reasonable objections to any such proposed person or entity, the Contractor shall submit a substitute to whom OPS and the PM has no reasonable objection. If the Subcontractor to whom OPS or PM has reasonable objection was capable of performing the subcontracted Work, the Contract Price may be increased or decreased by the reasonable difference in Cost occasioned by such substitution and documented by Contractor to OPS, and an appropriate Change Order shall be issued. No increase in the Contract Price shall be allowed for any such substitution unless the Contractor has acted promptly and responsibly in submitting names as herein required.

9.1.4. The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if OPS or PM makes reasonable objection to such Substitution.

9.1.5. The Contractor shall not sublet the Work as a whole. The approval of Subcontractors in no way relieves the Contractor from full responsibility for the Work or with compliance with the Contract Documents.

9.2 Sub-Contractual Relations

9.2.1. By an appropriate written Agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward OPS, the PM and the Architect. Said Agreement shall preserve and protect the rights of OPS, PM and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor Agreement the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against OPS. Where appropriate, the Contractor shall require each Subcontractor to enter into similar Agreements with Sub-Subcontractors. The Contractor shall make available to each proposed Subcontractor prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 9.2, and identify to the
Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of Documents available to Contractor’s Sub-Subcontractors.

9.3 **Subcontractor Lawsuits Against OPS**

9.3.1. No Subcontractor, sub-subcontractor, laborer, employee or agent of a Subcontractor or sub-subcontractor, nor equipment or material supplier shall bring or maintain, either directly or indirectly, in his own name or in the name of the Contractor, any claim or suit against OPS for any amount payable under the Contract Documents or for breach of Contract.

**Article 10 - Work by District or by Separate Contractors**

10.1 **OPS’s Right To Perform Work and to Award Separate Contracts**

10.1.1. OPS reserves the right to perform Work related to the Project with his own forces, and to award separate Contracts in connection with other portions of the Project or other Work on the site under these or similar General Conditions of the Contract for Construction. No claim for delay or additional cost shall be made solely due to the performance of such Work by OPS on such separate Contractor unless OPS or such separate Contractor actively interferes with the performance of Contractor’s Work is an increase not contemplated by the Contract Documents.

10.1.2. When separate Contracts are awarded for different portions of the Project or other Work on the site, the term “Contractor” in the Contract Documents in each case shall mean the Contractor who executes such separate owner - Contractor Agreement.

10.1.3. OPS will provide for the coordination of the Work of his own forces and of each separate Contractor with the Work of the Contractor, who shall cooperate therewith as herein provided.

10.2 **Mutual Responsibility**

10.2.1 The Contractor shall afford OPS and separate Contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their Work, and shall connect and coordinate Contractor’s Work with theirs as required by the Contract Documents. Wherever Work that is being done by OPS’s forces or by other Contractors is contiguous to Work covered by this Contract, the respective rights of the various interest involved shall be established by the Architect, to secure the completion of the various portions of the Work in general harmony.

10.2.2. If any part of the Contractor's Work depends for proper execution or results upon the Work of OPS or any separate Contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Architect any apparent discrepancies or defects in such other Work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of OPS’s or separate Contractors’ Work as fit and proper to receive his Work, except as to defects which may subsequently become apparent in such Work by others.
10.2.3. Any costs caused by Defective or ill-timed Work shall be borne by the party responsible therefor.

10.2.4. Should the Contractor wrongfully cause damage to the Work or property of OPS, or to other Work on the site, the Contractor shall promptly remedy such damage as herein set forth.

10.2.5. Should the Contractor wrongfully cause damage to the Work or property of any separate Contractor, the Contractor shall upon due notice promptly attempt to settle with such other Contractor by Agreement, or otherwise to resolve the dispute. If such separate Contractor sues or initiates any type of proceeding against OPS on account of any damage alleged to have been caused by the Contractor, OPS shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment or award against OPS arises therefrom, the Contractor shall pay or satisfy it and shall reimburse OPS for all attorneys' fees and court or arbitration costs which OPS has incurred.

10.3  **OPS's Right to Clean Up**

10.3.1. If a dispute arises between the Contractor and separate Contractors as to their responsibility for cleaning up as required by the Contract Documents, OPS may clean up and charge the cost thereof to the Contractors responsible therefor as OPS may determine.

**Article 11 - Miscellaneous Provisions**

11.1  **Successors and Assigns**

11.1.1. OPS and the Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, Agreements and obligations contained in the Contract Documents applicable to such party. Neither party to the Contract shall assign the Contract or sublet it as a whole without the prior written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the prior written consent of OPS.

11.2  **Written Notice**

11.2.1. Any written notice required hereunder shall be hand delivered, sent by prepaid, certified or registered United States mail, return receipt requested, or by any nationally recognized air courier that provides proof of delivery, and shall be sent to the following address:

If to Contractor:

The Contractor's address stated in the Agreement

If to OPS:

Assistant Superintendent of Business Services
Omaha Public Schools
3215 Cuming Street
11.3 **Claims for Damages**

11.3.1. Should either party to the Agreement suffer injury or damage to person or property because of any act or omission of the other party or of any of his employees, agents or others for whose acts he is legally liable, claim shall be made in writing to such other party.

11.3.2. Whenever reference is made to claims, costs or damages, or like terms, it shall include in each case, but is not limited to, all fees and charges of PM, Architects, consultants, engineers, attorneys and other professionals and all court costs; except that no award of attorneys’ fees shall be made against OPS.

11.4 **Bonds**

11.4.1. The Agreement shall be awarded contingent upon compliance with the following requirements, acceptance by OPS of required Bonds and furnishing of proper evidence of insurance as required by Article 15. All required Bonds shall be issued either:

11.4.1.1. Only by companies holding certificates of authority as acceptable sureties on federal bonds and as acceptable reinsuring companies and which are furthermore authorized to do business in the State of Nebraska. Such companies shall be included in the current Department of the Treasury fiscal service listing of certificate holders as published in the Federal Register and such Bonds shall be issued within three (3) business days following award of the bid, and the execution of an Agreement pursuant to such bid shall be contingent upon such Bonds being accepted by OPS as being in compliance with this paragraph; or

11.4.1.2. If Bonds are to be issued by companies not qualified as provided in 11.4.1.1 above, then the Contractor shall furnish to OPS information in addition to the Bonds required hereby. Bonds required hereunder shall be issued within three (3) business days following the award of the bid and the execution of an Agreement pursuant to such bid award shall be contingent upon such bonds being approved by OPS as being in compliance with the following requirements. The Contractor or such surety company shall, in addition to such Bonds submitted within the time limits described hereinabove, furnish the following:

1) The name and corporate address of the bonding company.
2) The registered agent of the corporate surety in Nebraska to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of the suretyship evidenced by such bonds.
3) A statement from the State Department of Insurance for the State of Nebraska reciting the amount of the allowed capital and surplus of such surety company as of the date of the last annual statutory financial statement.
4) A statement from the surety company stating that if any bond furnished hereunder is in an amount in excess of ten percent (10%) of the surety company’s capital and surplus, that the surety company has reinsured the portion of the risk that exceeds ten percent (10%) of the surety company’s
capital and surplus with one or more reinsurers who are duly authorized to do business in the State of Nebraska. The Surety Company shall also furnish the following additional information:

a) The name of the reinsurance company.
b) A copy of the reinsurance Contract, certified by the bonding company as a true and correct copy of the original, that will reinsure any Project of OPS, which will constitute written certification that the surety company has reinsured that portion of the surety company’s risk that exceeds ten percent (10%) of the surety company’s capital and surplus. Any reinsurance Contract to be furnished must satisfy OPS that the reinsurer is obligated to OPS to perform in the event of a failure of the surety company to perform under the provisions of the performance and/or payment bond.
c) A certification from the Nebraska Department of Insurance that the reinsurer is authorized to do business in the State of Nebraska.
d) A statement from the Nebraska Department of Insurance to the effect that the amount to be reinsured does not exceed ten percent (10%) of the reinsurer’s capital and surplus.

11.4.1.3. Failure to furnish any of the requirements set forth above for the performance and payment bonds shall authorize OPS to reject such awarded bid as not being to specifications and to award the bid to and execute a Contract with the bidder acceptable to OPS who meets the above requirements.

11.4.2. The Contractor at its own expense shall furnish Bonds (both performance bonds and payments bonds) as set forth in the Agreement and as provided by §52-118, Nebraska Revised Statutes, as amended, in the form required by the Contract Documents, covering the full and faithful performance of the Agreement and the payment of all obligations arising thereunder. All premiums for such Bonds shall be paid by the Contractor. The Contractor shall deliver the required Bonds to OPS not later than the date of execution of the Agreement. Each of the Bonds required hereunder shall be in an amount equal to 100% of the total Contract Price. The surety company executing the Bonds shall be acceptable to OPS. The Agreement shall not take effect until such Bonds are furnished by the Contractor and approved by OPS. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by any other portion of the Contract Documents. Contractor shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds required by the Contract Documents or hereafter required by Laws and Regulations. All Bonds signed by an agent must be accompanied by a certified copy of such agent’s authority to act.

11.4.3. Should it reasonably appear to OPS at any time during the existence of this Agreement, or from time to time, that the surety or sureties on said Contractor’s Bonds, or any of them, have become insolvent, bankrupt, or in conservatorship, or otherwise financially unable to protect OPS as required by the terms of the Contract Documents, OPS may demand, in writing, that the Contractor furnish additional or new Bonds executed by an approved surety company satisfactory to OPS. The act of OPS, with reference to demanding new or additional security, shall never be construed to relieve the original surety on its obligation under the said Bonds, or to relieve the Contractor. The Contractor, within ten (10) days after receiving the written demand, shall furnish additional or new Bonds, which must be acceptable to OPS. OPS may stop the Work under the Agreement until additional or new Bonds have been furnished by the Contractor, and OPS shall in no case be liable to the Contractor on account thereof. OPS may exercise the rights as provided herein to take charge of the Work in the event of the refusal or failure of the Contractor to comply with the demands of OPS with reference to furnishing additional or new Bonds.
11.4.4. Any surety executing a Bond upon the Contractor's Work under the Agreement, shall be deemed to have consented in advance to any changes in the Work made by order of OPS as set forth herein. Any changes in the Work made under the Contract Documents shall in no way alter or impair the obligations of such surety executing such a Bond.

11.5 Rights and Remedies

11.5.1. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder to OPS shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by Laws and Regulations., and, in particular, but not by way of limitation, the warranties, guarantees, and obligations imposed upon the Contractor by the Contract Documents are not to be construed in any way as a limitation of any rights and remedies available by Laws and Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. The rights and remedies available to OPS under this paragraph and under the Laws and Regulations, or by special warranty or guarantee or by the provisions of the Contract Documents are cumulative and are not exclusive. The election by OPS to utilize one type of remedy does not preclude from utilizing any other remedy in the at the same time or in the future, and shall not be construed by any court of law as an election of remedies.

11.5.2. No action or failure to act by OPS, Architect or PM shall constitute a waiver of any right or duty afforded any of them under the Contract Documents, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically set forth in writing.

11.6 Tests

11.6.1. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect and PM timely notice of its readiness so the Architect, PM and OPS may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities.

11.6.2. If the Architect determines that any Work requires special inspection, testing, or approval which Subparagraph 11.6.1 does not include, Architect will, upon written authorization from OPS, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 11.6.1. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's and PM's additional services made necessary by such failure, OPS shall bear the costs of such tests if such Work complies with the Contract Document, and an appropriate Change Order shall be issued, but shall not be obligated to Architect or PM for any additional sums.

11.6.3. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.
11.6.4. If the Architect, PM or OPS is to observe the inspections, tests or approvals required by the Contract Documents, they will do so promptly and, where practicable, at the source of supply.

Article 12 – Time

12.1 Computing Time

12.1.1. In computing any period of time prescribed or allowed by the Contract Documents, the day of the act, event, or default after which the designated period of time begins to run is not included. The last day of the period so computed is included unless it is a Saturday, Sunday, legal holiday by law of the United States or the State of Nebraska, or an official holiday of OPS, in which event the period runs until the end of the next day which is not a Saturday, Sunday, legal holiday or official school holiday.

12.1.2. A calendar day is a twenty-four (24) hour period measured from 12:00:01 a.m. until the following midnight.

12.1.3. With respect to Work in or in connection with OPS occupied facilities, it is expected that all Work will be performed during normal Working hours on regular Working days. Should the Contractor desire to Work at other times, advance requests shall be made to the building principal so that the areas can be made available. District personnel must be on hand at any time Work is in progress at such occupied location.

12.1.4. Contractor shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OPS. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as OPS and Contractor may otherwise agree in writing.

12.2 Progress and Completion

12.2.1. Time limits stated in the Contract Documents are of the essence of the Agreement.

12.2.2. The Contractor shall begin the Work on the date as herein before provided. Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

12.2.3. In the event of partial occupancy by OPS, the Project shall not be deemed Substantially Complete until the entire Work is Substantially Complete.

12.3 Delays, Extensions of Time and Liquidated Damages

12.3.1. If the Contractor is delayed at any time in the progress of the Work by any act or neglect of OPS, the PM or the Architect, or by any employee of OPS, the PM or the Architect, or by any separate Contractor employed by OPS, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably foreseeable, unavoidable casualties, or any causes beyond the Contractor's control, or by any other cause which the Architect determines may justify the delay, then the Contract Time
shall be extended by Change Order for such reasonable time as OPS may determine. Extensions of time shall be granted only because of delay preventing the execution of the major items of Work critical to the schedule for completion of the Work. There shall be no increase in the Contract Price due to any delay unless it is due to the active interference by Owner with the Contractor’s Work.

12.3.2. Any claim for extension of time shall be made in writing to the Architect not more than ten (10) days after the commencement of the delay; otherwise it shall be waived. In the case of a continuing delay only one claim is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. The Architect shall review the estimate and forward the request, with his recommendation, to the PM. The PM shall review the Architect’s recommendation and forward it to OPS with either a concurrence or a contrary recommendation. Claims for time extensions due to rain or snow days shall be handled on an individual monthly basis.

12.3.3. The amount of damage to OPS for delay in completion of the Work is difficult to ascertain and the amount of liquidated damages per calendar day as stated in the Agreement is reasonable anticipated pecuniary damages for such delay and is not a penalty. If the Work is not Substantially Completed within the Contract Time, Contractor shall pay to OPS the amount of liquidated damages determined by multiplying the number of calendar days past the Contract Time that the Work was not Substantially Completed times the per diem liquidated damages amount stated in the Agreement. OPS may deduct from any amounts otherwise due Contractor under the Contract Documents the amount of any liquidated damages owed by Contractor to Owner. No liquidated damages will be recovered or paid for any day included in an extension of the Contract Time which has been granted by Change Order. Neither and extension of time nor the collection of liquidated damages shall limit or exclude any other right or remedy of OPS under provision of the Contract Documents.

Article 13 - Payments and Completion

13.1 Schedule of Values

13.1.1 Before the first Application for Payment, the Contractor shall submit to the Architect, with a duplicate copy to the PM, a schedule or breakdown of values as hereinbefore required.

13.2 Applications for Payment

13.2.1. OPS shall make progress payments twice a month to the Contractor on account of the Contract Price as follows:

13.2.1.1 The Contractor shall submit to the Architect for approval an application for each progress payment one day each month or as mutually agreed, accompanied by the signed statements and other Documents required by the Contract Documents. Such applications for payment shall be itemized estimates in such form as the PM, in consultation with the Architect, may require based on the schedule of values and listing the “values” of labor and material incorporated in the Work and of materials delivered and suitably stored at the site. Such applications shall show the total such values, less retainage as provided in Paragraph 13.5.1 and less the aggregate of all previous payments, as the amount payable on account of the Contract Price. No progress payment shall be payable until the Application for Payment has been received and approved.
by the Architect and PM and has been approved for payment by the Board of Education. Should the Architect fail to forward the Application for Payment to the PM, OPS shall take such action as it deems appropriate, which action may include paying the Contractor the sum requested.

13.2.1.2 If the Contractor has submitted the Application for Payment as above, the Architect, with reasonable promptness, shall issue his Approval or Certificate for Progress Payment for such amount to the PM, not exceeding the amount shown by the application, as Architect deems properly payable on such application or estimate, furnishing copies of such Approval or Certificate to the Contractor. The PM shall review the Application for Payment with reasonable promptness, shall endorse the Approval or Certificate for such amount, not exceeding the amount approved by the Architect, as it deems properly payable on such application or estimate, furnishing copies of such Approval or Certificate to both the Architect and the Contractor, and forward the Approval or Certificate to OPS for payment.

13.2.1.3. No approval and no certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by OPS, shall constitute an acceptance of any Work.

13.2.1.4. Each application for a progress payment must be accompanied by statements, in such form as the PM, in consultation with the Architect, may require, signed by each subcontractor who has Worked, directly or indirectly, at the site or provided any portion of the Work, that such subcontractor has been paid all sums due and owing such endorsing subcontractor at the time of the Application.

13.2.2. The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to OPS either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, herein referred to as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an Agreement under which an interest therein or lien thereon is retained by the seller or otherwise imposed by the Contractor or such other person. Notwithstanding the passage of title to OPS, Contractor shall remain responsible for all damage to such Work, materials and equipment until acceptance of the Work as provided in Paragraph 4.2.10.

13.2.3. The issuance of a Certificate for Payment will constitute a representation by the Architect to OPS, based on its observations at the site as herein indicated and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of its knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that the Architect believes that the Contractor is entitled to payment in the amount certified. However, by issuing a Certificate for Payment, the Architect shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made
any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Price. The approval of the Certificate for Payment by the PM will constitute a representation by the PM to OPS that it concurs in the determination of the Architect and that the Architect has made sufficient investigation of the Work to reasonably determine that the Contractor should be paid the approved sum.

13.3 **Withholding Certificates for Payment**

13.3.1. If either the Architect or PM, or both, refuses to approve the full amount requested in the Contractor's Application for Payment, or if OPS refuses to approve such Application, the Architect shall notify the Contractor in writing of the reasons for withholding a Certificate.

13.4 **Progress Payments**

13.4.1. After the Architect has issued a Certificate for Payment, OPS shall, upon approval of the Application by the Board of Education, make payment in the manner and within the time provided in the Contract Documents. Until Work is fifty percent (50%) complete, OPS will pay ninety percent (90%) of the amount due the Contractor on account of progress payments. At the time the Work is fifty percent (50%) complete the retainage shall be reduced and maintained at five percent (5%) of the Contract Price to date, providing the manner of completion of the Work and its progress are and remain satisfactory to the Architect, PM and OPS reserves the right to reinstate the full retainage at any time during the performance of the Work.

13.4.2. The Contractor shall promptly pay each Subcontractor, upon receipt of payment from OPS, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate Agreement with each Subcontractor, require each Subcontractor to make payments to his Subcontractors in similar manner.

13.4.3. The Architect may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Architect on account of Work done by such Subcontractor.

13.4.4. Neither OPS, the PM nor the Architect shall have any obligation to pay or to assure the payment by Contractor of any moneys to any Subcontractor.

13.4.5. No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by OPS, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

13.5 **Payments Withheld**

13.5.1. The Architect, or PM, or both, may decline to certify payment and may withhold the Certificate in whole or in part, to the extent reasonably necessary to protect OPS, if the Architect or PM, are unable to make representations to OPS as provided herein. If the either or both the Architect or PM is unable to make representations to OPS as required by the
Contract Documents and to certify payment in the amount of the Application, the Architect will notify the Contractor as herein indicated. If the Contractor and the Architect, or PM, or both, as the case may be, cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect and the PM are able to make such representations to OPS. The Architect or PM, or both, may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the Architect or PM, or both, may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in the Architect's or PM's, or their, opinion to protect OPS from loss because of:

13.5.1.1. Defective Work not remedied,

13.5.1.2. Third party claims filed or reasonable evidence indicating probable filing of such claims,

13.5.1.3. Failure of the Contractor to make, payments properly to Subcontractors or for labor, materials or equipment,

13.5.1.4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price,

13.5.1.5. Damage to OPS or another Contractor,

13.5.1.6. Reasonable evidence that the Work will not be completed within the Contract Time, or

13.5.1.7. failure to carry out the Work in accordance with or to comply with the Contract Documents.

13.5.2. OPS may withhold approval of any certificate for Payment issued by Architect and withhold payment thereon for any of the reasons specified in Paragraphs 13.6.1.1 to 13.6.1.7, inclusive, or due to any other default by Contractor under the Contract Documents.

13.6 **Failure of Payment**

13.6.1. If the Architect does not issue a Certificate for Payment, or PM does not approve it, through no fault of the Contractor, within the time allowed by the Contract Documents after receipt of the Contractor's Application for Payment, or if OPS, without cause, does not approve the Certificate for Payment and pay the Contractor within seven (7) days after the date established in the Contract Documents any amount certified by both the Architect and PM, then the Contractor may, upon seven (7) additional days' written notice to OPS, the PM and the Architect, sent United States certified mail, postage prepaid, return receipt requested, stop the Work until payment of the amount owing has been received.

13.7 **Substantial Completion**

13.7.1. When the Contractor considers that the Work is Substantially Complete as defined in Paragraph 1.40, the Contractor shall notify, in writing, the Architect and PM, who shall prepare, in association with the Contractor, a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibilities of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work is Substantially Complete, he will then
prepare a Certificate of Substantial Completion which shall recommend to OPS the Date of Substantial Completion and shall fix the time within which the Contractor shall complete the items listed therein. The Architect shall submit the proposed Certificate of Substantial Completion to the PM for its approval. Upon approval by the PM, the Architect's recommendation for the Date of Substantial Completion shall be submitted to the Board of Education for approval. Warranties required by the Contract Documents shall commence on the date of approval by OPS of the Certificate of Substantial Completion of the Work.

13.7.2. No retainage will be released or paid until final payment unless otherwise expressly provided for in the Contract Documents.

13.7.3. Prior to Substantial Completion, each progress payment shall be equal to ninety percent (90%) of the proportion of the Contract Price properly allocable to labor, material, and equipment incorporated in the Work, less the aggregate of payments previously made and less such amounts as PM shall determine, or OPS may withhold, in accordance with Article 13.5 of the Standard General Conditions of the Construction Contract. Until the time that Work is fifty percent (50%) complete the retainage may be reduced and maintained at five percent (5%) of the Contract Price to date, providing the manner of completion of the Work and its progress are and remain satisfactory to the Architect, PM and OPS. OPS reserves the right to reinstate the full retainage at any time during the performance of the Work.

13.8 Final Completion and Final Payment

13.8.1. Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when he finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment to the PM stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that, the opinion of Architect, the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Architect's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth herein have been fulfilled. Upon receipt of the written final Certificate for Payment, the PM shall review same to insure that the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the Work was executed in a good and Workmanlike manner, that the Work meets the generally accepted standards for like construction in the Omaha, Nebraska metropolitan area and is in accordance with Laws and Regulations.

13.8.2. The Contractor shall not be entitled to receive the final payment until: (1) both the Architect and PM certify that the Work has been completed in accordance with the terms and conditions of the Contract Documents, was executed in a good and Workmanlike manner, meets the generally accepted standards for like construction in and around the City of Omaha, Nebraska and is in accordance with applicable Laws and Regulations, (2) all Documents to be provided by Contractor as a condition to final payment have been furnished, and (3) the final Certificate of Payment is approved by OPS.

13.8.3. Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that all payrolls, bills for materials and
equipment, and other indebtedness connected with the Work for which OPS or its property might in any way be or become responsible, have been paid or otherwise satisfied, (2) consent of surety on all Bonds to final payment and (3) other data establishing payment or satisfaction of all such obligations, such as receipts, releases, statements of subcontractors as required herein and waivers of liens arising out of the Agreement, to the extent and in such form as may be designated by OPS. If any Subcontractor refuses to furnish a release or waiver required by OPS, the Contractor may furnish a bond satisfactory to OPS to indemnify him against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to OPS all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys’ fees.

13.8.4. The making of final payment by OPS shall not constitute a waiver of any claims by OPS

13.8.5. OPS will not be required to, nor shall it, make final payment until all Work to be performed pursuant to the Contract Documents has been completed, approved and accepted by OPS and all Documents to be furnished by Contractor have been provided to OPS. The Contractor shall furnish PM, in a form adequate to the PM, satisfactory evidence of payment in full for all materials, labor and equipment and to all subcontractors used or employed in the Work prior to OPS making final acceptance to the Contractor. Contractor must all furnish PM with Final Certificates from all local inspection authorities prior to acceptance by OPS.

13.8.6. The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor in the written final Application for Payment as unsettled.

Article 14 - Protection of Persons and Property

14.1 Safety Precautions and Programs

14.1.1. The Contractor shall be primarily responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. However, the PM shall have the authority to monitor the Contractor on matters of safety in connection with the Work and the Work site. The PM, in his sole and absolute authority, shall have the authority to stop the Work when any violation is observed. Notwithstanding the authority of the PM, nothing contained in this paragraph or in any other provision in the Contract Documents shall act to relieve the Contractor of his liability for injuries to persons or property.

14.2 Safety of Persons and Property

14.2.1. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

14.2.1.1. employees on the Work and all other persons who may be affected thereby;

14.2.1.2. all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and
14.2.1.3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

14.2.2. The Contractor shall give all notices and comply with all Laws and Regulations and all lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

14.2.3. The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

14.2.4. The Contractor at his own expense and option shall employ watchmen or erect adequate fencing at such time as necessary to protect or attend his Work, including times when building exterior is breached to protect it and its contents.

14.2.5. When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel. Whenever the use of explosives or other hazardous materials or equipment is to be used, the Contractor shall give the Architect and PM a minimum of twenty-four (24) hour notice.

14.2.6. The Contractor shall promptly remedy all damage or loss (other than damage or loss to property insured as herein required and for which OPS has been paid the entire amount of its loss) caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, their respective agents or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable or for which the Contractor is responsible, except damage or loss directly attributable to the acts or omissions of OPS, PM or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable, in whole or in part, to the fault or negligence of the Contractor, any Subcontractor or Sub- subcontractor, their respective agents, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any one of them may be liable. The foregoing obligations of the Contractor are in addition to Contractor's obligations under Paragraph 8.15.

14.2.7. The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person (hereinafter called "Safety Manager") shall be the Contractor's supervisor unless otherwise designated by the Contractor in writing to OPS, PM and the Architect. The designated safety manager shall coordinate his or her duties with the Architect and PM.

14.2.8. The Contractor must promptly report in writing to the Architect and PM all accidents whatsoever arising out of, or in connection with, the performances of the Work, whether on or adjacent to the sites, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Architect and PM. If any claim is made by anyone against the Contractor or any Subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Architect and PM, giving full details of the claim. The requirements set forth in this Subparagraph 14.2.8 shall not act as any waiver by OPS of the provisions of any
applicable statute of limitations nor shall it act as a waiver of any immunity or other defense which OPS may otherwise have as a political subdivision.

14.2.9. The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety. The Contractor shall have full responsibility for preventing overstress of any structure or any part of member of it during construction. The Contractor shall fully check the effect of his operations in this regard, and shall provide all temporary support and connections required.

14.2.10. The Contractor shall protect and be responsible for any damage to the Work, any material and equipment incorporated in the Work and any material and equipment to be incorporated in the Work which is stored on the site or at off-site locations, from the date of the Agreement until the final acceptance of the Work and, as herein provided, shall make good without cost to OPS, any damage or loss that may occur during this period, except that in the event of partial or total occupancy by the OPS prior to final acceptance, OPS shall be responsible for any damage caused, in whole, by it during such partial or total occupancy. The Contractor shall handle all material as directed, so that it may be inspected by the Architect. All material affected by the weather shall be covered and protected to keep it free from damage while being transported to the site, as well as when it is stored on the site or at any off-site location.

14.3 Emergencies

14.3.1. In emergencies affecting the safety or protection of persons or the Work or the property at the site or adjacent to the site, Contractor, if time is of the essence, without special instruction or authorization from OPS, Architect, or PM, shall act to prevent threatened damage, injury or loss; but, in no event, shall the Contractor take any additional actions or perform any additional Work than is necessary to halt the emergency or to prevent threatened damage, injury or loss and to allow sufficient time for the Contractor to seek the advice and counsel of the Architect and PM. Contractor shall as soon as possible after the onset of the emergency, but in no event more than forty-eight (48) hours thereafter, give PM and Architect prompt written notice of the emergency conditions and the additional Work made necessary to halt the emergency. Architect, in consultation with the PM, shall immediately advise the Contractor in writing how to further proceed to remedy the conditions. If the emergency condition was caused, in whole or in part, by OPS, an equitable adjustment in the Contract Price or in the Contact Time, or both, may be allowed. If a claim is to be made for an equitable adjustment under this paragraph, it shall be made under, and governed by, the terms of Paragraph 7.5.

14.3.2. After the emergency is halted and the conditions creating the emergency remedied or halted, so that there is no immediate threat of damage, injury or loss, but in no event more than ten (10) days after the onset of the emergency, Contractor shall give Architect and PM written notice if Contractor believes that any significant future changes in the Work or variations from the Contract Documents will be necessitated by either the emergency conditions or the Work taken in response to the emergency. If Architect determines that a change in the Contract Documents is required to complete the Work, a Work Change Directive or Change Order will be issued, in the manner herein established, to document the consequences of such action. This Subparagraph 14.3.2. does not apply to a claim for equitable adjustment in the Contract Price or Contract Time, or both, made necessary by the actual Work performed or undertaken to prevent the threatened damage, injury or loss to persons or property; such claim or claims being made exclusively under the provisions of Subparagraph 14.3.1.
Article 15 – Insurance

15.1 Workers’ Compensation Insurance Coverage

15.1.1 For purposes of Paragraph 15.1, the following definitions shall apply:

15.1.1.1 Certificate of coverage (“certificate”) - A copy of a certificate of insurance, or satisfactory evidence of approval by the Nebraska Worker’s Compensation Court of authority to self-insure issued by the Court, showing statutory Workers’ compensation insurance coverage for the person’s or entity’s employees providing services on the Project, for the duration of the Project.

15.1.1.2 Duration of the Project - includes the time from the beginning of the Work on the Project until the Contractor’s/person’s Work on the Project has been completed and finally accepted by OPS.

15.1.1.3 Persons Providing Services on the Project - includes all persons or entities performing all or part of the Work the Contractor has undertaken to perform on the Project, regardless of whether or not that person Contracted directly with the Contractor and regardless of whether or not that person has employees. This includes, without limitation, independent Contractors, Subcontractors, subcontractors, suppliers, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. “Services” include, without limitation, providing, hauling, delivering, loading and unloading or installing equipment or materials, or providing labor, transportation, or other service related to a Project. “Services” does not include activities that are not related to performing of Work on the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

15.1.2 The Contractor shall provide Worker’s compensation insurance coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage Agreements, which meets the statutory requirements of Nebraska law for all employees of the Contractor providing services on the Project, for the duration of the Project. The Contractor must provide a certificate of coverage to OPS prior to performing any Work on the Project. If the coverage period shown on the Contractor’s current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with OPS showing that coverage has been extended.

15.1.3 Each person providing services on the Project shall maintain Worker’s compensation insurance coverage for all its employees. Each person providing services on the Project shall provide to Contractor (and by Contractor to OPS) a certificate of coverage, prior to that person beginning Work on the Project, so OPS will have on file certificates of coverage showing coverage for all persons providing services on the Project. All such persons shall provide to Contractor (and by Contractor to OPS) a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project. Contractor shall retain all required certificates of coverage for the duration of the Project and for at least one year thereafter.
15.1.4 Contractor shall notify OPS in writing by certified mail or personal delivery, within 10 days after Contractor knows or should have known, of any change that materially affects the provision of coverage of Contractor or of any person providing services on the Project.

15.1.5 Contractor shall post at the Project site a notice, in the text, form and manner prescribed by Nebraska law, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

15.1.6 By signing the Agreement or providing or causing to be provided a certificate of coverage, Contractor is representing to OPS that all employees of Contractor who will provide services on the Project, and all employees of persons providing services on the Project, will be covered by Workers' compensation insurance coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage Agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, all filings will be made with the Nebraska Worker's Compensation Court that are required of self-insurers.

15.1.7 Contractor shall include in all Contracts with persons performing Work on the Project the following provisions:

15.1.7.1 A clause stating as follows: “By signing this Contract or providing a certificate of coverage, the person signing this Contract is representing to Omaha Public Schools (OPS) that all employees of the person signing this Contract who will provide services on the Project will be covered by Workers' compensation insurance coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage Agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured person, all required filings will be made with the Nebraska Workers' Compensation Court that are required of self-insurers. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.”

15.1.7.2 Requiring the person to provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

15.1.7.3 Requiring the person to obtain from each other person with whom it Contracts, and provide to the Contractor a certificate of coverage, prior to the other person beginning Work on the Project and prior to the end of the coverage period, a new certificate of coverage showing extension of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

15.1.7.4 Requiring the person to retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;

15.1.7.5 Requiring the person to notify OPS in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of
any change that materially affects the provision of coverage of any person providing services on the Project; and

15.1.7.6 Contractually requiring the person to include in any Contract it has with any other person to provide services on the Project the requirements of subparagraphs 15.1.7.1 to 15.1.7.6, inclusive, with the certificate of coverage to be provided to the person for whom they are providing services.

15.2 Contractor's Liability Insurance

15.2.1 Contractor shall maintain for the duration of the Project, and pay all premiums upon, policies of insurance with minimum policy limits as follows:

**Employer's Liability**
- $500,000 per accident
- $500,000 disease, policy limit
- $500,000 disease, each employee

**Commercial General Liability**
- Bodily injury and property damage liability
- $1,000,000 each occurrence
- $2,000,000 aggregate

Coverage shall include completed operations, broad form property damage and personal injury and advertising liability coverages.

**Automobile Liability Insurance**
- Bodily injury and property damage liability
- $1,000,000 limit of liability

**Excess Liability**
- $2,000,000 limit of liability

15.2.2 The foregoing insurance coverage can be provided by any combination of base coverage and excess liability coverage so long as at least the same limits of liability are maintained. The commercial general liability policy shall contain a per Project aggregate endorsement. Except for the requirements of any provision in the Contract Documents calling for higher limits of liability or for additional or other insurance, all insurance required to be furnished by the Contract Documents shall be written by an insurance company reasonably acceptable to OPS and having an A minus rating or better by A.M. Best. Such insurance coverages shall be provided for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater. OPS shall be named as an additional insured on all policies of liability insurance. In the event Contractor fails to maintain any such insurance coverages, including those required in Paragraph 15.1, OPS may, but shall not be obligated to, obtain such insurance coverages in the name of Contractor, and the cost thereof may be deducted from any amount owed Contractor under the Contract Documents.

15.2.3 The insurance required by Paragraph 15.2.1 shall be written on an occurrence basis and shall include Contractual liability insurance and completed operations coverage for a minimum of 2 years applicable to the Contractor's obligations as herein indicated. Property Damage Liability Insurance and shall provide X, C and U coverages and Broad Form Property Damage, including Completed Operations.
15.2.4 Certificates of Insurance acceptable to OPS shall be filed with the PM, on behalf of OPS, prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty (30) days prior written notice has been given to OPS. The certificate shall also contain language substantially similar to the following: “Per Project aggregate applies to General Liability Policy. Owner and all other parties as required by Contract are named as Additional Insured on a primary and noncontributing basis. Attached is a copy of Additional Insured form or form number is indicated. A thirty-day written notice of cancellation applies.” The providing of any insurance hereunder, and the limits of coverages required hereunder shall not be deemed to in any way limit Contractor’s liability under the Contract Documents.

15.2.5 Each insurance policy provided under the Contract Documents shall provide by endorsement or otherwise that any change or changes made in the Project or the Work shall in no way alter or impair the obligations of such person, firm, or corporation issuing such an insurance policy. If notice of any change affecting the general scope of the Work is required by the provisions of any insurance policy to be given to a person, firm, or corporation issuing such an insurance policy, the giving of such Notice will be the Contractor’s responsibility, and the amount of the applicable policy will be adjusted accordingly.

15.2.6 Contractor shall require in its Contracts with Subcontractors that each Subcontractor maintain the same liability insurance coverages as are required of Contractor.

15.3 Property Insurance

15.3.1 OPS shall purchase and maintain, for the term of the Agreement, a builder's risk insurance policy, written on an all-risk form, covering the Work to be performed under this Agreement. The policy shall be in a form and amount, and placed with such insurance company as OPS shall determine in OPS's discretion, and shall have a deductible of $10,000. Such policy shall insure all Work in place, and all materials that are intended to be incorporated into the Work that are stored on site or that are stored off-site at locations that are approved by OPS. Such insurance shall include the interests of OPS, the Contractor, and Subcontractors in the Work to be performed under the Agreement. The builder's risk coverage of OPS is subject to the interests and property excluded from coverage and the perils excluded from coverage. For example, coverage under such policies shall not include site preparation, grading, paving and similar items. Coverage shall also not include any tools, equipment, protective fencing, or other property owned, rented or used by the Contractor or any Subcontractor. The builder's risk policy in effect for this Project is available for inspection at the Risk Management Office of OPS.

15.3.2 Contractor shall be responsible for any deductibles under the builder's risk policy, and should any loss occur that is insured under such policy, Contractor shall pay to OPS the amount of such deductible or the amount of such loss whichever is less. Contractor shall also be responsible for any loss or damage that is not covered under OPS's builder's risk insurance policies. Contractor shall promptly remedy any damage and loss (other than damage or loss insured under the OPS's builder's risk policy referred to above) to the Work to be performed hereunder and to any materials and equipment incorporated or intended to be incorporated therein.
15.3.3 Contractor, any Subcontractors, or others performing any portion of the Work pursuant to the Agreement, shall procure and maintain during the term of the Agreement, insurance on their property at the Project site, insuring such property against loss due to fire and extended coverage and physical loss and damage. Such policies of insurance shall also be endorsed to waive the insurer’s rights of subrogation against OPS. Contractor shall require by Contract that each subcontractor comply with the requirements for insurance in this Paragraph 15.4.3.

15.3.4 To the extent permitted by applicable policies of insurance, OPS and Contractor waive all rights against each other, and against the employees, agents, and Contractors of each other, for any loss or damage to property caused by fire or other perils of the type covered or to be covered by policies of insurance required to be carried hereunder, to the extent of any insurance proceeds payable under such policies.

15.3.5 Any loss insured under OPS’s builder’s risk insurance policy shall be adjusted solely by OPS, and OPS shall have the power to adjust and settle the loss with the insurer issuing such policy, as it determines in its discretion. Any policy proceeds payable under such policy due to any loss shall be paid to OPS on behalf of OPS and the other insureds under such policy as their interests shall appear. Any portion of such proceeds that are to be paid to any subcontractor or sub-subcontractor may be paid directly by OPS to such party.

15.3.6 In the event Contractor does not complete the Work in the Contract Time, OPS may, in addition to any liquidated damages assessed for such delay, deduct from any amounts owed to Contractor, the amount of any premium for such builder’s risk insurance policy attributable to coverage maintained by OPS after the date the Work was to have been completed.

Article 16 - Changes in Work

16.1 Change Orders

16.1.1. Except as expressly noted herein, no change in the Work shall be made unless in pursuance of a written change order approved and signed by OPS and countersigned by the Architect or PM; no claim for an addition to the Contract Price or for extra compensation or for additional Contract Time shall be valid unless so ordered.

16.1.2. OPS, without invalidating the Agreement, may order changes in the Work within the general scope of the Contract Documents consisting of additions, deletions or other revisions, the Contract Price and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.

16.1.3. The cost or credit to OPS resulting from a change in the Work shall be determined in one or more of the following ways:

16.1.3.1. By mutual acceptance of a lump sum price properly itemized and supported by sufficient substantiating data to permit evaluation;

16.1.3.2. By unit prices, if any, stated in the Contract Documents or subsequently agreed upon; or
16.1.3.3. By Contractor’s or Subcontractor’s direct cost to be determined in a manner agreed upon by the parties. In computing any cost of the Work based upon Contractor’s or Subcontractor’s costs of performing the Work, the amount computed for overhead and profit shall not exceed the following amounts:

1. Any Subcontractor’s or Sub-Subcontractor’s profit and overhead shall not exceed 15% of Subcontractor’s or Sub-Subcontractor’s total direct cost for such Work. Maximum allowance percentage of each change will not exceed the following: Fifteen percent (15%) overhead and profit on first $50,000; ten percent (10%) overhead and profit on balance of cost over $50,000.

2. Contractor’s profit and overhead on Work performed by Contractor’s own forces shall not exceed 15% of Contractor’s total direct cost for such Work. Maximum allowance percentage of each change will not exceed the following: Fifteen percent (15%) overhead and profit on first $50,000; ten percent (10%) overhead and profit on balance of cost over $50,000.

3. Contractor’s profit and overhead on Work performed by Contractor’s Subcontractors, or a Subcontractor’s profit and overhead on Work performed by a Sub-Subcontractor, shall not exceed 5% of the Subcontractor’s or Sub-Subcontractor’s total direct costs.

16.1.4. As used above, the term “direct costs” means the costs directly and necessarily incurred in the performance of the Work required, but shall not include any general office expense, overhead expenses, insurance costs, supervision costs, management salaries and any cost incurred in correcting defective or damaged Work. In addition to overhead and profit, the amount to be paid Contractor may also include any additional premium for any increase in the premium amount for any Bonds attributable to an increase in the amount of the Contract.

16.1.5. Contractor and each Subcontractor involved shall furnish evidence of direct costs by copies of original invoices for all materials and payroll vouchers for labor if the Architect upon written authorization from the PM or OPS directs changes in the Work to proceed in advance of reaching a price Agreement with the Contractor. The Architect is not authorized to give instructions to the Contractor that will increase the Contract Price unless the Architect has separate specific written authorization from OPS to do so. Any advice the Architect gives the Contractor shall in no way be construed as releasing the Contractor from fulfillment or performance of the requirements of the Contract Documents.

16.2 Claims for Additional Cost

16.2.1. The Contract Price may only be changed by a Change Order or by written Amendment or Modification, approved and executed by OPS, after approval by the Board of Education.

16.2.2. If the Contractor is directed by the Architect, the PM or OPS, or receives a Work Change Directive to perform Work different from and/or in addition to the Work required by the Contract Documents, or claims that any written interpretation will cause an increase in the Contract Price or cause additional costs and wishes to make a claim for such increase in the Contract Price or for extra costs to be caused by the such different and/or additional Work, or Work Change Directive, he shall give the Architect and the PM written notice thereof within five (5) days after receipt of the directive giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except for Work caused by Contractor responding to differing or unforeseen physical conditions under which the Work is to be performed or in an emergency endangering life or property, in which case the Contractor shall proceed as indicated in the Contract Documents, and any claim for an increase in the Contract Price or for extra costs or damages for such Work caused by
differing or unforeseen physical conditions or emergency Work shall be governed by the provisions herein set forth regarding such differing or unforeseen physical conditions or emergency Work, respectively. Such written claim for Work different from and/or in addition to the Work required by the Contract Documents, along with the recommendation of the Architect and PM, will be submitted to the Board of Education of OPS and its action shall be final and binding. Failure to give such notice shall be a waiver of the claim and such claim or possible claim shall be invalid and unenforceable. Compliance by the Contractor with this paragraph does not validate any claim otherwise invalid.

16.2.3. If the Contractor believes that the direction to perform different or additional Work than that required by the Contract Documents or that of a Work Change Directive will cause an increase in the Contract Price and the Contractor wishes to make a claim for such increase in the Contract Price or for additional costs to be caused by any such directive, he may not proceed to execute the different and/or additional Work directed by Architect, PM (or the Work Change Directive) or OPS, except for Work caused by Contractor responding to differing or unforeseen physical conditions under which the Work is to be performed or in an emergency endangering life or property, in which case the Contractor shall proceed as herein indicated until he receives a properly executed Change Order or Written Amendment or Modification. If the Contractor begins to execute the different or additional Work caused by such directive prior to receiving a properly executed Change Order or written Amendment or Modification. Contractor shall be responsible to complete any differing and/or additional Work at no additional cost to OPS.

16.3 Minor Changes in the Work

16.3.1. The Architect or the PM, or both, will have authority to order minor changes in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order, and shall be binding on OPS and the Contractor. Copies of such written orders shall be provided to the Architect, PM and the Contractor. The Contractor shall carry out such written orders promptly.

Article 17 - Uncovering and Correction of Work

17.1 Uncovering of Work

17.1.1. If any portion of the Work should be covered contrary to the request of the Architect or the PM or to requirements specifically expressed in the Contract Documents, it must, if required by the Architect or PM, or both, be uncovered for the Architect's or PM's, or their, observation a shall be replaced at the Contractor's expense.

17.1.2. If any other portion of the Work has been covered which the Architect has not specifically requested to observe prior to being covered, the Architect, with the concurrence of the PM, may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to OPS. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by OPS or a separate Contractor as provided herein, in which event OPS shall be responsible for the payment of such costs.
17.2 CORRECTION OF WORK

17.2.1. The Contractor shall promptly correct all Work rejected by the Architect, the PM or OPS as Defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's or PM's, or their representatives, additional services made necessary thereby.

17.2.2. If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof or within one (1) year after acceptance by OPS of designated equipment or within such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special warranty required by the Contract Documents, whichever period is longer, any of the Work is found to be Defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from OPS to do so unless OPS has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the Agreement.

17.2.3. The Contractor shall remove from the site all portions of the Work which are Defective or non-conforming, and which have not been corrected as herein required unless removal is waived by OPS.

17.2.4. If the Contractor fails to correct Defective or non-conforming Work as herein provided, OPS may correct it in accordance with the Contract Documents and the Contractor shall be responsible for, and shall promptly pay, all costs, damages and fees incurred by OPS in remediying the Defective or non-conforming Work. OPS may deduct the cost thereof from any amounts due Contractor.

17.2.5. If the Contractor, either before or after Substantial Completion, and either before or after final payment, does not remove from the Project site any Defective or non-conforming materials or equipment within a reasonable time fixed by written notice from the Architect or OPS, OPS may remove and store the materials or equipment at the expense of the Contractor. OPS shall have a security interest in all such materials and equipment to secure repayment by Contractor of all costs incurred by OPS in the removal, storage and sale thereof. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, OPS may upon ten (10) additional days' written notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's or PM's, or their, additional services made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to OPS.

17.2.6. The Contractor shall bear the cost of making good all Work of OPS or separate Contractors destroyed or damaged by such correction or removal.

17.2.7. The obligations of the Contractor under this Article 17 shall be in addition to and not in limitation of any obligations imposed upon him by special guarantees required by the Contract Documents or otherwise prescribed by law nor shall they be construed to establish any period of limitations with respect to OPS's right to enforce the Contract Documents in a court of law.
17.2.8. OPS shall have right to operate equipment until defects are corrected and warranties met and shall have right to operate rejected equipment until it is replaced without charge for depreciation, use or wear.

17.3 Acceptance of Defective or Non-Conforming Work

17.3.1. If OPS prefers to accept Defective or non-conforming Work, it may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Price where appropriate and equitable. Such adjustment shall be effective whether or not final payment has been made.

Article 18 - Termination of the Agreement

18.1 Termination by the Contractor

18.1.1. If the Work is stopped for a period of sixty (60) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency, making materials unavailable, through no act or fault of the Contractor or of a Subcontractor or their agents or employees or any other persons performing any of the Work under a Contract with the Contractor, or if the Work should be stopped for a period of thirty (30) days pursuant to the Contract Documents, then the Contractor may, upon fifteen (15) additional days written notice, sent to OPS, the PM, and the Architect, terminate the Agreement and recover from OPS payment for all Work executed to the date of such stoppage. Such payment shall not exceed the remainder, if any, after subtracting the total of previous payments made by OPS to the Contractor, of the lesser of:

a. The fair value (not including Contractor's cost or profit) of the executed Work, or,

b. An amount determined by multiplying the Contract Price, as adjusted by change orders, times the percentage of Work completed

18.2 Termination by OPS

18.2.1. If the Contractor is adjudged a bankrupt, or if Contractor makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of Contractor's insolvency, or if Contractor refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled Workmen or proper materials, or if Contractor fails to make prompt payment to Subcontractors or for materials or labor, or disregards Laws or Regulations or orders of any public authority having jurisdiction, or otherwise fails to comply with the requirements of the Contract Documents, then OPS, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any right or remedy and, after giving the Contractor and his surety seven (7) days written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method OPS may deem expedient. In such case the Contractor shall not be entitled to receive further payment, if any, until the Work is finished.
18.2.2. If the unpaid balance of the Contract Price exceeds the costs of finishing the Work, including compensation for the Architect's and/or PM's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance of the Contract Price, the Contractor shall pay the difference to OPS upon demand. Any such sum payable to OPS under the Contract Documents shall be payable by cashier's check (or equivalent) on a bank located in the City of Omaha, County of Douglas and State of Nebraska. The amount to be paid to the Contractor or to OPS, as the case may be, shall be certified by the Architect, upon application, in the manner herein provided, and this obligation for payment shall survive the termination of the Contract.

END OF SECTION
BURKE HIGH SCHOOL –
STADIUM IMPROVEMENTS

12200 Burke St,
Omaha, NE, 68154

Project No. 14013
10 January 2024

Project Manual
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SECTION 01 21 00 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

   B. Types of allowances include the following:

   1. Lump-sum allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight, and delivery to Project site.

B. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

   1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 ADJUSTMENT OF ALLOWANCES

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

   1. Include installation costs in purchase amount only where indicated as part of the allowance.

   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

2. No change to Contractor's indirect expense is permitted for selection of higher- or lower priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Lump-Sum Allowance: Include the sum of $XX,XXX for Best Access Systems electronics and programing at doors indicated on the Drawings ("X" openings at $2,075* per opening): Include Lump-Sum Allowance as specified in Section 281300 "Access Control" and as shown on Drawings. (* A/E to verify $$ per opening with OPS prior to issuing allowance.)

1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.

END OF SECTION
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SECTION 01 21 16 – CONTINGENCY ALLOWANCE

PART 1 - GENERAL

1.1 ALLOWANCE FOR CONSTRUCTION CONTINGENCY

A. Include in the Contract Amount a construction Contingency allowance of $__________.

B. The following shall apply to the Contingency Allowance:

1. It shall be used only to cover the cost of hidden, concealed conditions that develop during the project, which could not have been anticipated, or as directed by the Owner.

2. Work which is clearly a Change in Scope shall be authorized and paid for by means of a Contingency Allowance Expenditure Authorization (CAEA) executed in accordance with established Omaha Public Schools (OPS) procedures.

3. The Bidder shall include in his base bid on the project his profit and overhead, all bonds and insurance to cover the amount of the contingency; as each contingency authorization is processed, it will not include any profit or overhead for the General Contractor or costs for Performance Bond Insurance and Workers Compensation.

4. Contractor shall proceed with accomplishing the work only after receiving a properly executed Contingency Allowance Expenditure Authorization (CAEA) executed by the OPS.

5. The Contractor shall not bill the OPS for any work authorized by this procedure until the work has been accomplished.

6. Any part of the Contingency Allowance which is not used during the construction of the project shall be deducted from the Contract amount.

7. At the completion of the project, the Project Architect will reconcile all the work accomplished through properly executed Contingency Allowance Authorizations, and provide for the Contract amount adjustment through a properly executed change order.

C. The Contractor shall include the following in his Request for Proposal cost breakdown:

1. Material quantities and unit costs for each contractor and subcontractor involved in the change.

2. Labor breakdown for each contractor and subcontractor involved in the change.

3. Equipment rates and hours for each contractor and subcontractor involved in the change.

4. Subcontractor overhead and profit.

5. The General Contractors SHALL NOT INCLUDE OVERHEAD AND PROFIT, BONDS and INSURANCE and WORKERS COMPENSATION
COSTS as these costs are to be included in the contingency allowance amount.

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PART 3 - EXECUTION (Not Applicable)

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PART 1 GENERAL

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B. Procedures for pricing Alternates.
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1.03 ACCEPTANCE OF ALTERNATES
A. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES
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   1. Base Item: NO EAST CONCESSIONS BUILDING.
   2. Alternate Item: EAST SIDE CONCESSIONS BUILDING.
B. Alternate No. 2 - :
   1. Base Item: EXISTING GRADE TO REMAIN UNCHANGED AT THIS LOCATION.
   2. Alternate Item: WEST MEDIA SLAB, RAIL AND WALL COMPLETE.
C. Alternate No. 3 - :
   1. Base Item: NO HYDRATION STATION AND ASSOCIATED CANOPY STRUCTURE.
   2. Alternate Item: HYDRATION STATION AND ASSOCIATED CANOPY STRUCTURE.

PART 2 PRODUCTS - NOT USED
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PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and General Provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this section.

1.02 SECTION INCLUDES:
   A. Administrative and procedural requirements for substitutions.

1.03 DEFINITIONS:
   A. Substitutions: Changes in products, materials, equipment, and methods of construction from
   those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to
   changed Project conditions, such as unavailability of product, regulatory changes, or
   unavailability of required warranty terms.
   a. Substitutions for Convenience: Changes proposed by Contractor or Owner that are
   not required in order to meet other Project requirements but may offer advantage to
   Contractor or Owner.

1.04 ACTION SUBMITTALS:
   A. Substitution Requests: Submit three copies of each request for consideration within thirty (30)
   calendar days of contract award. Identify product or fabrication or installation method to be
   replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Complete form provided in Project Manual and submit an
   electronic (digital) copy.
   2. Documentation: Show compliance with requirements for substitutions and the following, as
   applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be
      provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other
      parts of the Work and to construction performed by Owner and separate contractors,
      which will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the
      Work specified. Include annotated copy of applicable Specification Section.
      Significant qualities may include attributes such as performance, weight, size,
      durability, visual effect, sustainable design characteristics, warranties, and specific
      features and requirements indicated. Indicate deviations, if any, from the Work
      specified.
      d. Product Data, including drawings and descriptions of products and fabrication and
      installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.
      g. List of similar installations for completed projects with project names and addresses
      and names and addresses of architects and owners.
      h. Material test reports from a qualified testing agency indicating and interpreting test
      results for compliance with requirements indicated.
      i. Research reports evidencing compliance with building code in effect for Project, from
      ICC-ES.
      j. Detailed comparison of Contractor’s construction schedule using proposed
      substitution with products specified for the Work, including effect on the overall
      Contract Time. If specified product or method of construction cannot be provided
      within the Contract Time, include letter from manufacturer, on manufacturer's
letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) calendar days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) calendar days of receipt of request, or seven (7) calendar days of receipt of additional information or documentation, whichever is later.


b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.05 QUALITY ASSURANCE:

A. Approval: All substitutions must be approved by Architect/Engineer and Omaha Public Schools (OPS).

1. Substitutions will NOT be considered during bidding. It is understood by all bidders that their offered bid is based solely upon the specified materials and systems.

2. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES:

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS:

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) calendar days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
SUBSTITUTION REQUEST FORM

To: Holland Basham Architects
119 South 49th Avenue
Omaha, Nebraska  68132

Project: Burke High School Stadium Improvements

Project No.: 14013 Date Received: ____________________________

Specification Section Number and Paragraphs: ________________________________

Drawings and Details Affected: ________________________________

Proposed Substitution: ____________________________________________

Manufacturer: _________________________________________________

Product (Model, Pattern, etc.): _______________________________________

WHY IS SUBSTITUTION BEING SUBMITTED? (Select One of the Following)

(____) Voluntary Alternate
(____) Specified Product is Not Available – Explain
(____) Cost Savings to Owner – Indicate Comparative Cost Analysis
(____) Other – Explain

EFFECTS OF PROPOSED SUBSTITUTION (Answer the Following Questions and Attach Explanations)

Does substitution affect dimensions indicated on the Drawings?
( NO) (YES, explain)

Does substitution affect work of other sections?
( NO) (YES, explain)

Does substitution require modifications to design, change to Drawings, or revisions to specifications to be incorporated into the project?
( NO) (YES, explain)

Attach list of at least three projects where proposed substitution has been used within past 12 months. Include name, address, and telephone number of Owner and Architect.

CONTRACTOR’S / BIDDER’S REPRESENTATION
Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitution into the project per Section 01 60 00.

SUBMITTED BY: ________________________________________________

For Architect’s Use:
Accepted (____) Not Accepted (____)
No Action Required (____)
Submission: Incomplete (____) Too Late (____)
Reviewed By/Date: ____________________________
Comments ____________________________

Subcontractor’s Signature and Date: ____________________________________________

Contractor’s Signature and Date: ____________________________________________
This page intentionally left blank
POST BID REQUEST FOR SUBSTITUTION FORM

Project: ____________________________  OPS Bid No.: ______________

Date Submitted: ____________________

CONTRACTOR’S REQUEST, WITH SUPPORTING DATA

1. Reason for Post Bid Substitution Request: ☐ Substitution for Cause ☐ Substitution for Convenience

______________________________________________________________________________

2. Specifications to which this request applies: ___________ - ___________ - ___________

Section       Page    Paragraph

Drawing(s) and Detail(s) affected: _______________ ___________________________________

☐ Product Data for proposed substitution is attached (description of product, reference standards, performance and test data).

☐ Sample is attached.  ☐ Sample will be sent if requested by Architect/Engineer

3. Itemized Comparison of proposed substitution with product specified

<table>
<thead>
<tr>
<th>ORIGINAL PRODUCT</th>
<th>PROPOSED SUBSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer/Brand: ______________</td>
<td>______________</td>
</tr>
<tr>
<td>Product (model, pattern, etc.): ______________</td>
<td>______________</td>
</tr>
<tr>
<td>Significant Variations: ______________</td>
<td>______________</td>
</tr>
</tbody>
</table>

Attach list of at least three projects where proposed substitution has been used within past 12 months. Include name, address and telephone number of Owner and Architect.

4. Unit costs of original product and proposed substitution. State whether cost is for:

☐ Material only,  ☐ Material installed, or  ☐ Life Cycle cost of installed product.

Original Product: $___________ per __________  Substitution: $___________ per _________

5. Proposed change in Contract Sum:

Credit to Owner: $________________________  Additional Cost to Owner: $________________________

6. Proposed Change in Contract Time: ☐ Reduce  ☐ Increase  by ________ calendar days

7. Effect of proposed substitution on other parts of the Work, or on other Contracts:

______________________________________________________________________________

______________________________________________________________________________
CONTRACTOR’S STATEMENT OF CONFORMANCE
OF PROPOSED SUBSTITUTION TO CONTRACT DOCUMENTS

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

1. Believe that it is equal or superior in all respects to the originally specified product, except as stated in #3 above;
2. Will provide the same warranty as required in the General Conditions;
3. Will provide the same special warranty or guarantee as specified;
4. Have included all cost data and cost implications of the proposed substitution;
5. Will pay redesign and special inspection costs caused by the use of this product;
6. Will pay additional costs to other contractors caused by the substitution;
7. Will coordinate the incorporation of the proposed substitution in the Work;
8. Will modify other parts of the work as may be needed, to make all parts of the work complete and functioning;
9. Waive future claims for added cost to Contractor caused by the proposed substitution.

Contractor: _____________________________________  Date: ________________
(Signature)

Firm: _______________________________________________________________________________

ARCHITECT/ENGINEER’S REVIEW AND ACTION

☐ Provide more information in the following categories. Resubmit.

__________________________________________________ ___________________________

☐ Sign Contractor’s Statement of Conformance. Resubmit.

☐ The proposed substitution is rejected, use specified material(s):

☐ The proposed substitution is approved, with the following conditions:

__________________________________________________ ___________________________

The following changes will be made by Change Order:

Addition to / deduction from the Contract Sum: $______________

Addition to / deduction from the Contract Time: _____________ calendar days

Architect/Engineer Name

By ________________________________  Date: ________________
(Signature)

OWNER’S REVIEW AND ACTION

☐ The proposed substitution is approved, per the Architect/Engineer recommendation.

☐ The proposed substitution is rejected, use specified material(s).

OPS Schoolhouse Planning

By ________________________________  Date: ________________
(Signature)
Notes for inclusion into any Post Bid Request for Substitution specifications

- Substitutions will NOT be considered during bidding.
- Use calendar day references in lieu of working days. (i.e. 21 calendar days in lieu of 15 days)
- Contractor proposed Substitution for Convenience will not be allowed.
- Only Substitutions for Cause will be considered and are to be submitted no later than 21 calendar days prior to the time required for preparation and review of related submittals.
  - Substitutions for Cause: changes proposed by Contractor that are required due to changed project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
- All substitutions must be approved by Architect/Engineer and Omaha Public Schools (OPS). Acceptable forms of acceptance upon approval: Change Order or Architect’s Supplemental Instructions (ASI) for minor changes in the work.
- Requested substitutions must have received necessary approvals of authorities having jurisdiction prior to approval.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and General Provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 CHANGES IN THE WORK
   A. Owners Changes: The Owner may make changes in the Work without invalidating the original Contract. All changes shall be made by Change Order and may revise the Contract sum or Time of Completion.
   B. Changed Conditions: The Contractor shall immediately notify the Architect if actual conditions are materially different from those described in the Contract Documents. Conditions shall be left undisturbed if directed by the Architect. The Architect will promptly investigate the site and revise the Contract Documents, if needed.
   C. Authority to Proceed:
      1. The Contractor shall obtain the Owner’s written approval before making any changes in the Work.
      2. Disagreements regarding proposed changes shall be addressed in accordance with this Article.
   D. Change Order Proposal Procedure:
      1. The Contractor shall submit a written proposal within fourteen (14) calendar days of receiving a Change Proposal request.
      2. Proposals shall be submitted on Contract Change Proposal forms and Cost Estimate Detail Sheets provided by the Owner.
      3. Proposals shall be with maximum charges being the amounts actually incurred or the maximum rates permitted herein, whichever is less. Proposals shall be prepared in accordance with Paragraphs 1.2, E. through K.
      4. Change Proposals, upon approval by the Owner, will be incorporated into the Contract by Change Order.
   E. Additive Changes:
      1. Direct Labor Costs: Direct labor costs are estimated labor cost developed by estimating the number of craft hours necessary to perform the change multiplied by the hourly cost for the particular trade involved or industry standard hourly labor costs. The hourly costs shall be based on the following:
         a. Basic Wages/Fringe Benefits: Hourly rates and fringe benefits shall be stated. Direct supervision shall not exceed fifteen percent (15%) of the cost of direct labor and if a working supervisor’s hours are covered, other supervision shall not be allowed.
         b. Worker’s Insurance: Direct contributions, to the State of Nebraska, such as industrial insurance, medical aid and supplemental pension, by the class and rates established by the State of Nebraska.
         c. Federal and State Payments: Direct contributions required by the Federal Insurance Compensation Act, (FICA); Federal Unemployment Tax Act (FUTA) and the State of Nebraska.
      2. Direct Material Costs: Direct material costs are an itemization of the estimated quantity and cost of materials necessary to perform the proposed change. Material pricing shall be developed from actual known costs, supplier quotations or standard industry pricing guides. Material costs shall consider all offered or available discounts and rebates. Freight costs, express charges or special delivery charges shall be itemized.
      3. Construction Equipment Costs: Construction equipment costs are an itemization of the type of equipment and the length of time the construction equipment will be used on the proposed change. Cost will be allowed for construction equipment only if used for the
changed work or additional rental costs are actually incurred by the Contractor. Equipment cost shall be developed from one of the following sources:

a. Current rental rates established by National Contractor’s Association for equipment.

b. If equipment is required for which a rental rate is not established in any of the above, an agreed rate shall be established for the equipment using the Data Quest Rental rate (Blue Book), or similar as a basis for verifying rates.

c. Such rates and the use of the equipment on the work must be approved by the Owner prior to performing the work.

4. Subcontractor Proposals: Subcontractor Proposals are to be itemized as specified in Paragraphs 1, 2, and 3 above.

5. Overhead and Profit by the Contractor Actually Performing the Work: Allowances not to exceed fifteen percent (15%) for overhead and profit for the party performing the work will be based upon the value of labor, material and the use of construction equipment as defined in Paragraphs 1, 2, and 3 above. Maximum allowance percentages of each change will not exceed the following: Fifteen percent (15%) overhead and profit on first $50,000; ten percent (10%) overhead and profit on balance of cost over $50,000. This allowance shall compensate the Contractor for all personnel not included in Paragraph 1 above, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, taxes, office engineering, estimating costs, additional overhead because of extended time and any other cost incidental to the performance of the change in work.

6. Overhead and Profit by the Contractor on Subcontractors Actually Performing the Work.

a. The Contractor’s or upper tier subcontractor’s fee on work performed by lower tier subcontractor will be based upon the net increased cost to the Contractor or upper tier subcontractor as applicable. Maximum allowable fees on charges will not exceed five percent (5%).

b. No direct labor by the Contractor will be allowed to be added to a subcontractor’s proposal. Costs incurred by the Contractor that are in excess of allowance specified in Paragraph 5, must be detailed in accordance with Paragraphs 1, 2, and 3.

7. Cost of Any Increase or Decrease in Premium by Insurance and Bonds caused by the Change:

a. Contractor’s Liability Insurance: To the above, the costs of the Contractor’s liability insurance is to be added after overhead and profit have been calculated.

b. Bonds: To the above, the cost of the Contractor’s bonds is to be added after overhead and profit have been calculated.

F. Variation in Estimated Quantity: If the quantity of a unit-priced item in this Contract is estimated quantity and actual quantity of the unit priced item varies more than fifteen percent (15%) above or below the estimated quantity, equitable adjustment in the Contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115% or below 85% of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request in writing an extension of time, to be received by the Architect and copy to the Project manager within fourteen (14) calendar days from the beginning of the delay, or within such further period as may be granted by the Owner before the date of Acceptance of Contract. Upon the receipt of a written request for an extension, the Owner shall ascertain the facts and make an adjustment for extending the completion date as, in the judgment of the Owner, is justified.

G. Deductive Changes: The Contractor shall itemize Deductive Changes as required in Paragraph E. Additive Changes, Subparagraphs 1 through 5 and 7.

H. Additive Changes and Deductive Changes Together:

1. If a Change in the Work involves both additive and deductive Changes for the same type of work, the appropriate overhead and profit amounts allowed will be added to the net difference of items of direct labor, material, construction equipment, small tools and upper tier Subcontractor proposals.
2. If other unrelated Additive Changed items are included in the same Change Proposal, the appropriate overhead and profit allowed is to be applied to these individual changed items.

3. Changes Under $700: If the description of the Change in the Work is, in the opinion of the PM, definitive enough to determine fair value and total of the Change does not exceed $700, no breakdown is required.

I. Time and Material (T&M) Work: When it is authorized in writing by the Project Manager, the cost of the Change shall be based on actual cost for time and materials spent on work performed. The Contractor shall conform to the following:
   1. Labor must be identified on worker’s daily time sheets.
   2. Time sheets must be submitted within two (2) working days for Project Manager’s review and approval.
   3. If supervisor’s hours are included as an itemized labor cost, supervision markup will not be allowed.
   4. Material Charges must be supported by invoices.
   5. The Contractor shall not exceed any cost limit(s) without prior written approval.

J. Disagreements: In the event the Contractor does not agree upon the adjustment in Contract compensation amount, scope of work, or time extension, the following shall apply:
   1. Adjustments:
      a. During the proposal review process, the Architect, Project Manager or Owner may discover discrepancies or arithmetic errors. If the discrepancy does not exceed $50, no change will be made to the estimate. If the discrepancy exceeds $50 a correction will be made and the Change Proposal process shall continue with the new value. This process will avoid delay in the processing of Change Proposals.
      b. Upon completion of the change proposal, the Contractor shall either accept the proposal as adjusted, or within fourteen (14) calendar days of receipt of the adjustment, notify
         c. the Project Manager in writing of any disagreement in the manner specified in Paragraph 2 - Written Notice.
         d. Invoicing for changes constitutes Contractor’s acceptance of the change scope, the dollar value, and extension of time (if any) unless invoicing occurs after notice has been submitted to the Owner for disputed proposals.
   2. Written Notice: When the Contractor disagrees with either a Contract interpretation or a processed Change Order, a letter shall be submitted to the PM as outlined below:
      a. Explain the nature of the disagreement and the Contractor’s position.
      b. Outline applicable Sections of the Contract Documents and explain which Sections support the Contractor’s position.
      c. In the event that monetary compensation is sought, provide detailed cost breakdown of compensation requested.
      d. Provide documentation which supports a request for other than monetary relief, including updated construction schedule for any request for time extension.
   3. Direct the Contractor to do the Work: The Project Manager may direct the Contractor to proceed with the Work by issuance of a written authorization pending resolution of disputed items.
   4. Dispute Resolution Process: The Architect, Project Manager, and the Contractor shall review and negotiate the items in disagreement in an effort to clarify and resolve the dispute. All resolutions shall be incorporated into a Contract Change Order.

PART 2 - PRODUCTS (NOT APPLICABLE) PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
SECTION 01 2973
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.
   B. The approved schedule of values, all change orders and stored materials must be shown on
      AIA Document G703.

1.02 FORMAT:
   A. Schedule of values must follow AIA Document G703 format.

1.03 SUBMITTAL:
   A. Submit Two (2) copies of the Schedule of Values with the Submittal of the Contract Schedule
      Documents.

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General provision of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY:

A. The Work under this Contract will be planned, scheduled, executed and reported pursuant to the provisions of Articles 2.4.4, 8.7, and 12 of the General Conditions, Article 4 of the Owner-Contractor Agreement ("Contract Time") and the Specified Completion Dates in the Bid and Agreement Form.

B. The services provided by the Project Manager as the Owner's agent, the existence of schedules, networks, Gantt charts or any other charts or services prepared or performed by the Project Manager, shall in no way relieve the Contractor of the responsibility of complying with all of the requirements of the Contract Documents, including, but not limited to, the responsibility of completing the Work within the Contract Time and the responsibility of planning, scheduling, and coordinating the Work. The Contractor is required to comply with all control procedures specified herein and with any reasonable changes that may be necessary, in the opinion of the Project Manager, during the Contract duration.

C. All milestones or Specific Completion Dates listed in these specifications, or elsewhere in the Contract Documents, represent only the major items of construction/erection work or interface dates. The Completion Dates are considered essential to the satisfactory performance of this Contract and to the coordination of all work on the project. The Specific Dates listed represent the latest allowable completion dates. Earlier completion dates may be established as agreed by the Contractor and the Project Manager.

D. Should the Contractor plan to complete the Work earlier than any required Milestone or Completion date, the Owner or the Project Manager shall not be liable to the Contractor for any costs or other damages if the Contractor is unable to complete the Work before such Milestone or Completion date.

E. The Contractor shall provide all information and input required for development of the schedule for the work according to the requirements of this Section. The purpose of the project schedule shall be to:
   1. Assure adequate planning, scheduling and reporting during execution of the contract;
   2. Assure coordination of the work of the Contractor and the various subcontractors and suppliers;
   3. Assist the Contractor, Project Manager and Owner in monitoring the progress of the work and evaluating proposed changes to the Contract and the project schedule;
   4. Assist the Contractor, Project Manager and Owner in the preparation and evaluation of the Contractor's monthly progress payments;
   5. The Contractor shall involve all applicable Subcontractors in the schedule development, updating, and revisions, as required.

1.03 DEFAULT:

A. Failure of the Contractor to comply with the requirements of this section shall constitute reason that the Contractor is failing to prosecute the work with such diligence as will insure its completion within the contract terms and shall be considered grounds for termination by the Owner.

PART 2 - SPECIFIC REQUIREMENTS

2.01 GENERAL REQUIREMENTS:

A. The work under this contract will be planned, scheduled, executed and reported using the critical path method (after this called CPM).
2.02 POST AWARD ACTIVITIES:
   
A. Network Requirements
   1. Within twenty (20) calendar days of the Notice to Proceed, the Contractor shall submit to the Project Manager for review and comment, a CPM Schedule in precedence form for the construction/erection work scope. A copy of this schedule shall be submitted to the Design Consultant. The CPM Schedule shall provide a complete and detailed sequence of operations of the Work within the time limits specified in the Contract.
   
a. The CPM Schedule diagram shall include:
      1) The order and interdependencies of the Contractor's activities and the major points of the interface or interrelation with the activities of others, including Specific Dates for completion. The following criteria shall form the basis for assembly of the logic:
         (a) What activity must be completed before a subsequent activity can be started?
         (b) What activities can be done concurrently? This includes activities with Start-To-Start and Finish-To-Finish relationships with or without leads and lags.
         (c) What activity must be started immediately following a completed activity?
      2) Activities should be linked between major area separations of the project so that the individual areas do not imply complete independence. The critical path should run through all major areas, since the entire project must be completed.
      3) Conformance with and identification of the Specific Dates specified in the Contract Documents.
      4) The description of work by activity.
      5) Off-Site Activities: The Contractor shall include in the CPM Schedule all procurement activities that are long lead items. Off-site activities shall include the following:
         (a) Dates for submittals, ordering, manufacturing or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to the site shall be clearly noted;
         (b) All significant Contractor activities during the fabrication and erection/installation including materials/equipment purchasing, and delivery;
         (c) Contractor's drawings and submittals to be prepared and submitted to the Design Consultant. Submittals, equipment orders and similar items are to be treated as Schedule activities, and shall be given appropriate activity numbers.
      6) Required delivery dates of Owner-furnished material and equipment.
      7) Shop fabrication and delivery.
      8) Critical Path (or Paths).
      9) Testing of equipment and materials.
   
b. The identity, duration and logic of activities comprising the CPM Schedule shall meet the following criteria:
      1) Activity boundaries shall be easily measurable and descriptions shall be clear and concise. Do not preface activity descriptions with "Begin" or "Complete." The beginning and end of each activity shall be readily verifiable, and progress should be quantifiable.
      2) Responsibility for each activity shall be identified with a single performing organization.
      3) Potential problems or constraints related to the implementation of the construction plan shall be identified in writing.
      4) Normal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures and/or precipitation to ensure completion of all work within the Contract Time. Normal weather conditions shall be determined by an assessment of average historical climate conditions based upon the preceding ten (10) year records published for the locality by the National Ocean and Atmospheric Administration (NOAA)
5) Utility coordination, no-work periods, expected job learning curves, and other foreseeable delays to activities shall be considered and included in the planning and scheduling of all work.
6) Maximize Start-To-Start and Finish-To-Finish activity relationships. Overlapping activities minimizes out-of-sequence problems that arise when most relationships are Finish-To-Start with zero lead or lag.
7) Imposed completion dates for events other than the Specified Completion Dates will not be permitted.

2. The level of detail of the CPM Schedule shall be, no activity shall exceed thirty (30) calendar days in duration, except for non-construction activities such as shop drawing and sample submittals, fabrication and delivery of materials and equipment, delivery of equipment, concrete curing, and General Conditions activities, or with the approval of the Project Manager.

3. The CPM Schedule shall show an early completion date for the project that is not earlier and/or later than the project's required completion date. All activity durations shall be given in working days. The CPM Schedule also shall show the following for each activity:
   a. Interfaces with the work of outside contractors, e.g., utilities, power, and with any separate contractor.
   b. Description.
   c. Estimated duration.
   d. Early start (by calendar date).
   e. Late start (by calendar date).
   f. Early finish (by calendar date).
   g. Late finish date (by calendar date).
   h. Total float available in workdays.
   i. Actual start date (by calendar date).
   j. Actual finish date (by calendar date).
   k. Activity codes (s).
   l. The Critical Path for the project, with said path of activities being clearly and easily recognizable on the time-scaled CPM Schedule Diagram. The relationship between all non-critical activities and activities on the Critical Path shall be clearly shown on the CPM Schedule Diagram.
   m. The responsibility code for the Contractor or Subcontractor performing each activity or portion of the activity.
   n. The percentage complete of each activity in progress or completed whether manually input or computer calculated.

4. It is to be expressly understood and agreed by the Contractor that the Schedule is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that the Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" date shown in the initial Schedule, or in an updated or revised Schedule; nor does the Owner or Project Manager guarantee that Contractor can always proceed in the sequence established by said Schedule. If Contractor's Schedule shows that the Owner or a separate contractor is to complete an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees in writing to same; the Owner's, the Project Manager's and/or the Design Consultant's review and approval of the Schedule does not constitute an agreement to specific dates, duration's, or sequences for activities of the Owner or any separate contractor.

B. Submittals: Within twenty (20) calendar days after Notice to Proceed, the Contractor shall submit to the Project Manager, with a copy to the Design Consultant, for review and comment, a CPM Schedule in precedence form for the construction/erection work scope. The submittal of the contract scheduling documents, as well as for each Schedule Update shall include:
   1. A plotter-generated detailed CPM network showing activity descriptions, durations and relationships between activities. The critical path should be easily identifiable.
2. Two (2) copies of the following reports: 1) Standard CPM report, including, as a minimum, activity numbers, descriptions, early and late start and finish dates, and total float; the report shall be sorted by Activity Number, Early Start, and Total Float; 2) Predecessor/Successor report, showing the above information plus the predecessors and successors for each activity.
3. A USB Flash Drive, containing the schedule data files. The Contractor shall develop the schedule using the software capable of providing the CPM schedule with level of detail as described above.

C. Approval Process
1. The Project Manager will review the Contractor's Schedule, including logic diagrams and computer-generated analysis. The Contractor is encouraged to comply with all of the submission requirements of the scheduling specification as set forth in the Section above entitled "Submittals." If the Contractor submits a reasonably complete package that complies with the requirements, the Project Manager shall have ten (14) calendar days to review and comment in writing.
2. The Contractor shall revise and resubmit the Schedule as soon as practical but in all cases within ten (10) working days. The Project Manager will have five (5) working days to review and comment on the revised Schedule.
3. Within five (5) working days following acceptance of the Schedule, the Contractor shall provide one (1) copies of the CPM Schedule with Computer Reports to the Project Manager for final review and acceptance. The Project Manager will have the final review and acceptance within four (4) working days.
4. Upon approval, the Schedule will become the official Project Schedule and will be used to monitor progress of the Work, subject to such revisions made to the Schedule as provided for herein or in the Contract Documents, and to support requests for payment.
5. If the Contractor thereafter wishes to make changes in its method of operating and scheduling, he shall follow the procedures set out in Paragraph 2.08, Network Revisions, of this Section.
6. Acceptance by the Owner/Owner's Representative of the Contractor's CPM Schedule shall not relieve the Contractor of the responsibility for accomplishing the Work within every Contract-required Milestone and Completion date. The Owner and Owner's Representative disclaims any obligation or liability due to acceptance of the CPM Schedule.
7. If the Contractor fails to provide the schedules within the time prescribed, or revisions to the schedule within the requested time, the Owner may withhold approval of payment until the Contractor submits the required information.

2.03 COMPUTER SCHEDULE REPORTS:
A. Every Month the Contractor will generate Schedule Reports from the CPM Schedule Network, based on the progress of the work. These computer reports will reflect the progress of the project with respect time. The Contractor will generate these reports for the information and use of the Owner in reviewing and monitoring progress and payment applications.

2.04 SCHEDULE UPDATES:
A. The Contractor understands and agrees that their schedule is intended to accurately reflect at all times the status of the Project construction. The Contractor also understands and agrees that updating the schedule is a key component of this requirement and will make every reasonable effort to provide current information.
B. Separate update meetings will be held to report schedule progress and to review the Contractor's Application for Progress Payment. The Application for Progress Payment is produced by the Contractor based on the Schedule of Values of the cost-loaded CPM. In each case, the previous month's CPM reports will be used to record progress. The Contractor understands and agrees that updating the schedule is independent from updating the cost for progress payment purposes.
C. The progress report submitted by the Contractor will indicate, as a minimum, those activities, or portions of activities, which were completed during the reporting period, the actual start and finish dates for those activities, remaining duration and/or estimated completion dates for activities currently in progress.

D. The Project Manager and the Owner will not be obligated to review or to process any Application for Progress Payment until the Contractor has submitted a Progress Report and the percentages of completion are agreed to by the Project Manager, Design Consultant and the Contractor.

E. Throughout the progress of the Work, the Contractor shall prepare and maintain a three week manual bar chart field schedule reflecting the schedule of work activities accomplished for the previous week and the work scheduled for the forthcoming two weeks. This manual field schedule shall be updated weekly.

F. When updating the computerized schedule, the Contractor must use the option that retains the logic. Primavera calls this option "Retained Logic." Any option that overrides the logic and allows activities that have started out-of-sequence to float to the project end date is not permitted. Since other scheduling systems may have different features for handling out-of-sequence activities, the Project Manager will evaluate the options and notify the Contractor in writing which option is acceptable.

G. Specific dates for schedule updates shall be agreed and established by the Project Manager, Architect/Engineer and Owner, but shall be, at a minimum, monthly.

2.05 CONTRACTOR'S ORGANIZATION:

A. The Contractor shall maintain, as part of its organization, a staff of sufficient size knowledgeable in the use and application of CPM, the Contractor's staff will be responsible for preparing the CPM schedule, monitoring progress, updating and revising logic diagrams when necessary.

2.06 RECOVERY SCHEDULE:

A. Should any of the conditions exist, such that certain activities shown on the Contractor's CPM Schedule fall behind schedule to the extent that any of the Specific Dates are in jeopardy, the Contractor shall be required, at no extra cost to the Owner, to prepare and submit to the Project Manager, in addition to the Construction Schedule, a supplementary Recovery Schedule, in a form and detail appropriate to the need, to explain and display how he intends to reschedule those activities to regain compliance with the CPM Schedule during the immediate subsequent pay period. The preparation of a recovery schedule shall not be grounds for a Change Order or a Time Extension.

B. The Contractor shall do the following, after determination of the requirement for a Recovery Schedule:

1. Within three (3) calendar days, the Contractor shall submit a Recovery Schedule for acceptance to the Project Manager. The Recovery Schedule shall be prepared to similar level of detail as the CPM Schedule and shall have a maximum duration of one (1) month.

2. Any revisions necessary because of this review shall be resubmitted by the Contractor for acceptance within two (2) calendar days of the conference. The approved Recovery Schedule shall then be the Schedule that the Contractor shall use in planning, organizing, directing, coordinating, performing and executing the Work (including all activities of subcontractors, equipment vendors and suppliers) for its one (1) month duration, to regain compliance with the CPM Schedule.

2.07 NETWORK REVISIONS:

A. The Contractor understands and agrees that their schedule is intended to accurately reflect at all times the status of the Project construction. The Contractor also understands and agrees that changes or revisions to the schedule are key components of this requirement and will make every reasonable effort to provide information as quickly as possible so that the CPM schedule accurately reflects current conditions.
B. Should the Contractor, after approval of the initial CPM Schedule want to change the plan of construction, he shall submit the requested revisions to the Project Manager including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate milestones and specific dates and the reasons for the revisions. The Project Manager will have ten (10) working days to review and either approve the change or reject the change in writing to the Contractor. If the requested changes are approved by the Project Manager they will be incorporated by the Contractor into the CPM Schedule in the next reporting period.

C. Pursuant to Article 12.3 of the General Conditions, the Contractor shall revise the schedule to include the effect of changes, acts of God or other conditions or events that have affected the CPM Schedule. The Project Manager will have ten (10) working days to review and either approve the change or reject the change in writing to the Contractor. If the requested changes are approved by the Project Manager they will be incorporated by the Contractor into the CPM Schedule in the next reporting period.

D. When the Owner orders changes by Change Order that have the potential to impact the Contract Milestones or Specific Dates stipulated, a Network will be prepared by the Contractor and provided to the Project Manager. After the Owner accepts the Network, it will be incorporated into the CPM Schedule by the Project Manager.

E. Neither the updating or revision of Contractor's Detailed Construction Schedule nor the submission, updating, change or revision of any report or schedule for Owner's review or non-objection of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way Contractor's obligations under this Contract.

F. If at any time during the construction, it appears to the Project Manager that the Contractor's schedule no longer represents the actual prosecution and progress of the work, the Project Manager will request in writing a revision to the schedule. Any "out of sequence progress" problems will be considered evidence that the schedule needs revising. The Contractor then has three (3) working days to respond to that written request. In the event the contractor does not agree with the conclusion of the Project Manager regarding the schedule status of the project, it shall be resolved in accordance with the disputes clause of the contract.

G. Failure to furnish any required submittal or information specified herein shall constitute a cause for withholding any part of progress payments pursuant to Article 13.6 of the General Conditions.

2.08 FLOAT TIME:

A. Float or slack time is the amount of the time between the earliest start date and the latest start date, or between the earliest finish date and the latest finish date of a chain of activities on the CPM schedule. Float or slack time is not for the exclusive use or benefit of either the Contractor or the Owner. Contractor's work shall proceed according to start dates, and the Project Manager shall have the right of reserve and apportion float time according to the needs of the project.

2.09 DELAYS AND TIME EXTENSIONS:

A. When the Contractor experiences change orders or delays and the Contractor requests an extension of time, the Contractor shall submit to the Project Manager a written Time Impact Analysis and impacted CPM schedule illustrating the impact of each change or delay on the current contract schedule completion date. The activity times used in the Time Impact Analysis shall be those included in the latest project schedule update.

B. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustments for the activity or activities affected by any condition or event that entitles the Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Documents.
C. Each Time Impact Analysis shall be submitted within fifteen (15) calendar days after a delay occurs or notice of direction for proceeding with a change order is given to the Contractor. If the Contractor does not submit a Time Impact Analysis within the specified time period, the Contractor's rights to any additional time and cost are waived.

D. Approval or rejection of each Time Impact Analysis shall be made with fifteen (15) calendar days after receipt, unless subsequent meetings and negotiations are necessary. A copy of the approved Time Impact Analysis signed by the Owner and the Project Manager will be returned to the contractor for incorporation into the schedule. The changes to the schedule will be incorporated into the Project Schedule during the first update after agreement is reached on the Time Impact Analysis.

E. In the event the Contractor does not agree with the decision of the Owner regarding the impact of a change or delay, it shall be resolved in accordance with the disputes clause of the contract.

2.10 COORDINATION:

A. The Contractor shall coordinate the work with that of the other contractors and shall cooperate fully with the Project Manager in maintaining orderly progress toward completion of the Work as scheduled.

B. Failure of Owner-furnished equipment and materials to arrive as scheduled, or failure of other construction contracts to meet their schedule, shall not be justification for an extension of time, except where such failure causes, in the opinion of the Project Manager, an unreasonable delay in the Contractor's work, in which case the provisions of the General Conditions regarding extensions of time and extra work shall apply.

C. The Contractor shall keep himself/herself, and subcontractors, advised always while the Work is progressing regarding delivery status of Owner-furnished equipment and material and of the progress of construction work being performed under separate contracts.

D. The Contractor shall involve all applicable Subcontractors in the schedule development, updating, and revisions, if required.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
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PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SECTION INCLUDES:
   A. Coordination of work of the Contract.

1.03 RELATED SECTIONS:
   A. Section 01 3319 – Progress Meetings
   B. Section 01 7329 – Cutting and Patching

1.04 DESCRIPTION:
   A. Coordination, Scheduling, Submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provision for accommodating items to be installed later.

1.05 MEETINGS:
   A. In addition to Progress Meetings specified in Division 01 Section "Progress Meetings," hold coordination meetings and pre-installation conferences with personnel and subcontractors to assure coordination of work.

1.06 GENERAL COORDINATION:
   A. Coordinate all portions of the Work under the Contract. Require subcontractors to coordinate their portion of the Work and provide their requirements for coordination of their work with other related Work.
   B. Coordinate mechanical and electrical Work with that of other trades in order that various components of systems are installed at proper time, fit available space, and allow proper service access to those requiring maintenance, including equipment specified in other Divisions.
   C. Coordinate Work of Sections having interdependent responsibilities for installing, connecting to, and placing in service, such as equipment.
   D. Coordinate use of project space and sequence of installation of mechanical, plumbing, and electrical work which is indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
   E. In normally occupied areas, except as otherwise shown, conceal pipes, ducts, conduit, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements. Provide escutcheon plates at penetrations through finished surfaces with finish appropriate to adjacent finish surface.

1.07 COORDINATION OF DRAWINGS:
   A. Schedule and coordinate submittals specified in Section 01340.
   B. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such as equipment.
   C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on Work of other Sections.

1.08 COORDINATION OF SPACE:
   A. Coordinate use of Project space and sequence of installation of mechanical, and electrical work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and
conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and repairs.

B. In finished areas except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

C. Phasing drawings are provided for coordination and separation of the on-site school activities and the General Contractor. Phasing documents note the primary work locations for the General Contractor during each Phase. The Phasing delineation shown on the Documents is not meant to restrict all work components that may be required for installation per the Contract Documents. The General Contractor must notify and coordinate with the Owner any installation of materials outside of the “Phase” limits, i.e. utility connections, etc.

1.09 COORDINATION OF CONTRACT CLOSE-OUT:

A. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion of portions of Work designated for Owner partial occupancy.

B. After Owner occupancy of premises, coordinate access to site by various Sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner’s activities.

C. Assemble and coordinate close-out submittals specified in Division 01 Section “Project Close-Out.”

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
A. Drawings and General Provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SUMMARY:
A. Section includes requirements for the Submittal Schedule and Administrative and Procedural Requirements for submitting Shop Drawings, Product Data, Samples, and other Submittals.

1.03 DEFINITIONS:
A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

1.04 ACTION SUBMITTALS:
A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Submittal category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Architect's final release or approval.
g. Scheduled date of fabrication.
h. Scheduled dates for purchasing.
i. Scheduled dates for installation.
j. Activity or event number.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS:

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals. (Architect/Engineer to review with OPS regarding fee if any.)

   a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement; see attached.
   d. The following digital data files will be furnished for each appropriate discipline:
      1) Floor plans.
      2) Reflected ceiling plans.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 21 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 21 calendar days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 21 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
a. File name shall use project identifier and Specification Section number followed by a dash and then a sequential number (e.g., 06 10 00-00). Resubmittals shall include a numeric suffix after another dash (e.g., 06 10 00-00-00, 06 10 00-00-01, etc.).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
   j. Specification paragraph number or drawing designation and generic name for each of multiple items.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Indication of full or partial submittal.
   o. Transmittal number, numbered consecutively.
   p. Submittal and transmittal distribution record.
   q. Other necessary identification.
   r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES:

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Post electronic submittals as PDF electronic files directly to Jacobs ProLog Server location, specifically established for Project.
   2. Submit electronic submittals via email as PDF electronic files.
   3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable: (original printed to pdf - scanned not acceptable)
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:
      a. PDF electronic file. (scanned submittals are not permitted with exception of field record drawings).

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).

3. Submit Shop Drawings in the following format: PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format: PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.
U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 DELEGATED-DESIGN SERVICES:

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

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW:

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Project Closeout."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION:

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION
SECTION 01 3319
PROGRESS MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 SECTIONS INCLUDES:
   A. Scheduling and administration of progress meetings.
   B. Reinstallation conferences.

1.03 PROGRESS MEETING:
   A. The Project Manager will schedule and administer weekly construction progress meetings, throughout progress of Work. They will prepare agenda, and distribute notice of meeting to participants, and distribute minutes with-in five (5) days after meeting.
   B. Project Manager shall make physical arrangements.
   C. The Project Manager will preside at meetings, record minutes, and distribute copies after meeting to participants, and to entities affected by decisions at meetings.
   D. Location of Meetings: Contractor’s field office.
   E. Attendance: Contractor, job superintendent, subcontractors, and suppliers, as appropriate to agenda; Owner, PM, Architect and professional consultants as appropriate.
   F. Anticipated Agenda:
      1. Approval of minutes of previous meeting.
      2. Review of Work progress and Contractor’s daily manpower reports.
      3. Field observations, problems, and decisions.
      4. Identification of problems which impede planned progress.
      5. Review of submittals, schedule and status of submittals.
      6. Review of off-site fabrication and delivery schedules.
      7. Maintenance of progress schedule.
      8. Corrective measures to regain projected schedule.
      9. Planned progress during succeeding work period.
     10. Coordination of projected progress.
     11. Maintenance of quality and work standards.
     12. Effect of proposed changes on progress schedule and coordination.
     13. Other business relating to Work.

1.04 PREINSTALLATION CONFERENCES:
   A. When required in individual Specification Sections, convene a pre-installation conference at work site prior to commencing work of the Section.
   B. Require attendance of entities directly affecting, or affected by, Work of the Section.
   C. Notify PM and Architect seven (7) days in advance of meeting date.
   D. Prepare agenda, preside at conference, record minutes, and distribute copies within five (5) days after conference to participants, with two (2) copies to Architect.
   E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
SECTION 01 3523
SAFETY PRECAUTIONS AND PROGRAMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.02 PROTECTION OF PERSONS, PROPERTY SAFETY PRECAUTIONS AND PROGRAMS:
A. Contractor Responsibility: The Contractor is solely responsible for initiating, maintaining and supervising all safety precautions and programs required under its portion of the Work on a day-to-day basis. The Program Manager shall obtain and review the Contractor's Project Site Safety Program for general conformance with the Contract terms and conditions.

B. Safety Overview:
1. Each Contractor and its subcontractors of all tiers shall be responsible for the health, safety and security of employees under their control and as to their area of Work and will submit a copy of their specific Project Site Safety Program to the Program Manager prior to commencement of any Work.
2. The Contractor shall recognize that it is important to its business and the Owner's Project to prevent the occurrences of incidents that lead to occupational injuries or illnesses. Safety, Health and Security requirements on this Project shall be prepared and administered by the Contractor in accordance with the following:
   a. The accident prevention policy shall be based on a sincere desire to eliminate personal injuries, occupational illnesses, and equipment and property damage; and to protect the general public exposed to or associated with the Work;
   b. The importance of safety on the Project shall be recognized and accident prevention shall be an integral part of all planning and operations;
   c. Contractor and its subcontractors shall conduct Work in a safe and practical manner in conformance with Occupational Safety and Health Act of 1970 (OSHA) and all additions and revisions thereto, the latest edition of the Manual of Accident Prevention, Associated General Contractors of America;
   d. In addition to the Contractor’s Project Site Safety Program, the Contractor and its subcontractors shall follow all applicable Federal, State and local laws/regulations pertaining to safety, health, pollution control, water supply, fire protection, sanitation facilities, waste disposal and other related items;
   e. Each Prime Contractor shall cooperate fully with all other Contractors and the Program Manager in their respective Safety, Health and Security programs;
   f. Good housekeeping shall be observed at all times, and waste, debris, and garbage shall be removed daily or placed in appropriate waste containers outside of the work place and all materials, tools and equipment shall be stored in a safe and orderly fashion; and
   g. Each Contractor shall educate its employees and its subcontractors and their employees as to the site specific Safety, Health and Security Plan(s) and to enforce adherence to safe work procedures outlined in these General Conditions.
   h. Should the Owner or the Program Manager observe a Contractor, subcontractor or its supervisors or employees engaged in an unsafe act or improperly utilizing equipment in such a manner that creates an inherently dangerous condition which puts the life or safety of job site personnel at risk or in danger, then the Contractor agrees that the Owner or Program Manager has the right to immediately stop such Work or acts. This non-compliance will be documented using the Field Observation Notice and submitted to the Contractor. The safety concerns shall be immediately address by the Contractor, who shall correct the hazard or condition prior to resuming Work in the area. An employee and his/her supervisor that creates a potential hazard to his/her self, other employees, to equipment or property will be issued a safety warning. The accumulation of two safety warnings by such individual and his/her supervisor shall
warrant a 30 day suspension of the employee and his/her supervisor from the Project Work Site. Upon return, if another serious breach of safety occurs, the involved employee and his/her supervisor, they will not be allowed to work on site or be on the Contractors’ Project Payroll for a period of one year on Omaha Public Schools’ projects.

C. Safety Program:
1. Each Contractor and its subcontractor(s) of any tier shall be required to submit its company Project Safety Site Program to the Program Manager for review of compliance with the contract requirements before starting any Work.
2. The Contractor shall provide a written Project Site Safety Program, maintain injury records as required by OSHA, keep the Program Manager informed of all serious and/or lost time injuries, and make available to the Program Manager information on injury logs, safety meetings including topics and a sign-in sheet for each meeting, inspection reports and other items concerning Project safety.
3. Contractors’ employing more than a combined total of 50 or more employees (including sub-tier contractors) shall be required to employ a dedicated full time Safety Representative knowledgeable in the areas of safety, health and fire prevention. Contractors’ employing a combined total of less than 50 employees (including sub-tier contractors) will be required to identify a supervisory employee having knowledge and experience in safety to act as the designated Safety Representative to assist the Contractors supervision in the conduct of its safety program and responsibilities. This individual shall have the responsibility and authority to act as liaison with the Owner, Program Manager, the Contractor and its subcontractors on all matters related to safety. This individual shall have the full authority, and shall exercise same as necessary to ensure safe work practices and correct unsafe hazardous conditions.
4. The Contractor shall inform the Owner and the Program Manager of any Federal or State inspection, and the Owner and Program Manager will receive copies of all Federal and State inspection reports, citations, penalties, abatement dates, etc.
5. The Contractor shall give full cooperation to the Owner and Program Manager personnel, who may periodically observe the Project Work Site without prior notice.

D. Safety Orientation for Contractor Supervision:
1. The Contractor and its subcontractors shall meet with the Program Manager to review and agree to the following:
   a. Safety procedures at the Project;
   b. Safety orientation and meetings for trades personnel (schedule and methods to be used);
   c. Record keeping requirements for inspections, violations
   d. Employee complaints and discipline;
   e. Injury reporting and Investigation;
   f. Sanitation and water supply system;
   g. Work Activities Requiring Permits; and
   h. Traffic incidents and accidents.
2. The Contractor shall be responsible for written documentation of all such meeting.

E. Employee Safety Orientation and Safety Meetings:
1. The Contractor or its subcontractor(s) of any tier shall follow OSHA Act 1926.21 (b) (2) requirements that state “that each employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment.”
2. The Contractor shall provide site and safety orientation to all employees as they begin Work on the Project. This orientation shall cover general safety rules, potential hazards, site work rules, the wearing of protective equipment and the relationship of the Owner’s and Program Manager’s personnel assigned to the Project. Attendance at the mandatory briefing is required of all Contractors’ employees. The Contractor and each of its subcontractors shall keep a record of all attendees and topics discussed.
3. The Contractor and each of its subcontractors shall hold weekly Toolbox Meetings at the Project site. It is the responsibility of the Contractor and/or its subcontractor(s) to furnish the following documentation to the Program Manager after each safety meeting: date, topics discussed, meeting chair, names of employees who were present, names of employees who were absent, trade and/or subcontractor name.

F. Accident Reports:
1. All accidents or occurrences resulting in employee injury and/or property damage shall immediately be verbally reported by the Contractor to the Program Manager. An Accident investigation with a formal written “Accident Report” and “First Report of Injury” shall be completed and forwarded to the Program Manager within 24 hours, but not later than the end of the working day after the occurrence or Accident. Any incidents involving the police or law enforcement agency shall also be included in this documentation.
2. All recordable occupational injuries and illnesses, other than First Aid cases, shall be submitted with the Payment Application to the Program Manager. Failure to provide this information will delay the processing of the Contractors Payment Application.
3. The Owner and Program Manager will meet on a regular basis to review safety and claims. At this time any Contractor or its subcontractor who has adverse accident experience shall have a senior executive of the company attend in person and report on the cause of the accident, what corrective measures have been instituted and the status of “Return-to-Work” for injured employees.

G. First Aid and Medical Treatment:
1. The contractor will establish a network of physicians, hospitals and medical facilities for the treatment of injuries.
2. Utilizing an established 911 protocol, the Contractor shall be required to provide for the immediate transportation and treatment of any employee who may be injured or become ill while on the Project to the appropriate facility.
3. The Contractor shall maintain a first aid kit supplied according to current regulations and shall have a certified person trained in first aid and CPR identified on site to cover those periods outside of normal project working hours.
4. Each Contractor shall maintain a log of all minor First Aid Treatments and will provide to the Program Manager a copy of such log monthly or as directed.

H. Employee and Visitor Dress Requirements:
1. The Project shall be a 100% hard hat, durable work shoe and safety glasses (meeting ANSI requirements) project. All supervisors, employees and visitors shall be required to wear hard hats, durable work shoes and safety glasses while on the Project Work Site.
2. It will be the responsibility of the Contractor and its subcontractors to insure that all of its employees wear durable work shoes and under no conditions shall its employees wear shorts, tank tops, sleeveless shirts, clothes or footwear with large openings, street shoes, tennis shoes or sandals.
3. All employees shall be properly and completely clothed while working. Bare torsos, legs and feet will not be allowed.
4. Other appropriate personal protective equipment shall be provided and worn as required for personal safety and protection.

I. Emergency Notification: A procedure will be established by the Contractor to provide emergency communications to all individuals on the site. This procedure shall be submitted to the Owner and Program Manager for their review. This procedure will not be used to handle routine calls to individuals.

J. Failure to Comply with Safety Regulations:
1. Failure to comply with the Contract safety requirements will be considered as non-compliance with the Contract and may result in remedial action provided by the Contract.
2. If the Owner and/or the Program Manager notifies the Contractor of any non-compliance with the provisions of this program, the Contractor shall make all reasonable efforts to correct the unsafe conditions or acts. Satisfactory corrective action shall be taken within the time specified by the Owner and Program Manager.
3. If a Contractor or subcontractor refuses to correct unsafe or unhealthy conditions or acts, the Owner and Program Manager may take one or more of the following steps:

4. Cease the operation or a portion thereof until the condition is brought into compliance with the Contractor’s Project Site Safety Program or procedures and the Project Master Safety Requirements.
   a. Require the Contractor to replace or supplement its Site Safety Representative and/or the supervisory personnel
   b. Stop payment for the Work being performed
   c. Correct the situation using other employees or contractors and back charge the Contractor for expenses incurred. All costs, including but not limited to those above, associated with insuring a safe and health conscious work environment shall be borne by the non-complying Contractor and costs will be back charged to the non-conforming Contractor. Each Contractor shall be responsible for payment of all fines and/or claims for damages levied against the Owner or the Program Manager for deficiencies relating to conduct of Contractor’s Work.

K. Safety of Persons and Property:

1. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
   a. All employees on-site and all other persons who may be affected thereby;
   b. All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of its subcontractors, sub-subcontractors or suppliers; and
   c. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation of replacement in the course of construction.

2. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Contractor shall erect and maintain as required by existing conditions and progress of the Work, until the acceptance of the completion of its portion of the project, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

3. If the use of explosives and other hazardous materials or equipment is necessary for the prosecution of the Work, the Contractor shall contact the Owner/Program Manager prior to starting the work.

4. All damages or loss to any property referred to in the “Safety of Persons and Property” Section of these General Conditions caused in whole or in part by the Contractor, any subcontractor, any sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, shall be remedied by the Contractor, except damage or loss attributable to faulty drawings or specifications or to the acts or omissions of the Program Manager, the Owner or anyone employed by any of them or for whose acts either of them may be liable, and which damage or loss is not attributable to the fault or negligence of the Contractor.

5. The Prime Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

L. Emergencies: In any emergency affecting the safety of persons or property, the Contractor shall act to prevent threatened damage, injury or loss.

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
PART 1 - GENERAL

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

1.02 SUMMARY:
A. Section includes administrative and procedural requirements for quality assurance and quality control.
B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

1.03 DEFINITIONS:
A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
3. Provide Mockups of any masonry repair on the original building.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, “experienced” means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS:

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.05 ACTION SUBMITTALS:

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.06 INFORMATIONAL SUBMITTALS:

A. Contractor’s Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
1.07 UNIQUE CHARACTERISTICS OF EACH QUALITY-CONTROL SERVICE REPORTS AND DOCUMENTS.

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.08 QUALITY ASSURANCE:

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

J. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven (7) calendar days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
a. Allow seven (7) calendar days for initial review and each re-review of each mockup.

K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

L. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockups of the following rooms:

M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 33.

1.09 QUALITY CONTROL:

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

C. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section 01 33 00 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

J. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required. SPECIAL TESTS AND INSPECTIONS:
1. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   a. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
   b. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   c. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
   d. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   e. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   f. Retesting and re-inspecting corrected work.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 ACCEPTABLE TESTING AGENCIES: OWNER WILL BID WORK TO QUALIFIED FIRMS.

3.02 TEST AND INSPECTION LOG:

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

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, reference during normal working hours.

3.03 REPAIR AND PROTECTION:

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

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

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

END OF SECTION
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SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY
   A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

1.02 USE CHARGES
   A. New Facilities:
      1. Cost or use charges for temporary facilities shall be included in Contract Sum. Allow other entities engaged in construction activity on site to use temporary services and facilities without cost.
   B. Existing:
      1. Water Service: Use water from Owner's existing water system without metering and without payment of use charges
      2. Electric Power Service: Use electric power from Owner's existing system without metering and without payment of use charges.

1.03 QUALITY ASSURANCE
   A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:
      1. Building Codes, including local requirements for permits, testing, and inspection.
      2. Health and safety regulations.
      3. Utility company regulations and recommendations governing temporary utility services.
      5. Police and Rescue Squad recommendations.
      6. Environmental protection regulations governing use of water and energy, and the control of dust, noise and other nuisances.
   C. Refer to “Guidelines for Bid Conditions for Temporary Job Utilities and Services”, as prepared jointly by AGC and ASC for industry recommendations.
   D. Inspections: Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications, and permits for use.

1.04 SUBMITTALS
   A. Reports and Permit: During progress of the Work, submit copies of reports and permits required by governing authorities or necessary for installation and efficient operation of temporary services and facilities.
   B. Submit and Review Construction Jobsite fencing and temporary facilities placement with Owner and Project Manager prior to mobilization on site.

PART 2 - PRODUCTS

2.01 DRINKING-WATER FIXTURES:
   A. Containerized, tap-dispenser, drinking-water, including paper cut supply.

2.02 HEATING EQUIPMENT:
   A. Unless owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

PART 3 - EXECUTION

3.01 TEMPORARY UTILITY INSTALLATION

A. New Facilities:
1. Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
2. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.
3. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
4. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.

B. Alteration and Additions:
1. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
2. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

1. Toilets: Use of Owner's existing toilet facilities will not be permitted.

D. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.02 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. General: Provide a reasonably neat and uniform appearance in temporary construction and support facilities acceptable to the architect/engineer and the Owner.

B. Field Office: For new construction, additions and phased projects and new construction provide temporary field offices of sufficient size to accommodate required office personnel at the project site. Furnish suitably with not less than a desk and chairs, a 4-drawer file cabinet, plan rack, 6-shelf bookcase, and table and chairs suitable for conducting a meeting of 10 - 12 attendees.

C. For Fire, Life Safety, Security and Technology upgrade projects, to have project meetings that are held at the school. The location and meeting schedule to be arranged with the school principal.

D. Telephone Service: Provide field office temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities.
E. Internet Access (WIFI): Provide temporary internet access (WIFI via land line with Modem or "hot-spot") throughout construction period for common-use by Owner, Architect, and Owner’s Project Manager in temporary construction office.

F. Sanitary Facilities:
   1. General: Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations that will best serve Project’s needs.

G. Dewatering Facilities and Drains:
   1. General: Dispose of rainwater subsurface water or other fluids in a lawful manner which will not result in flooding the Project or adjoining property, nor endanger either permanent work of temporary facilities. Control and suitably dispose of water and other fluids by means of temporary pumps, piping drainage lines or other methods.
      a. Provide temporary drainage where the roofing or similar waterproof deck construction is complete prior to the connection and operation of the permanent drainage piping system.

H. Project Identification & Jobsite Signs:
   1. Project Sign: Project identification sign will be supplied by Owner. Sign to be installed by Contractor. Contractor to provide support posts for 4’ x 8’ sign provided by Owner.
   2. Provide temporary directional and safety signage as necessary and/or as directed by Architect of Project Manager.
   3. For project sites that receive Fire, Life Safety, Security and Technology upgrades, site banners will be provided in lieu of a 4 x 8 plywood sign.
   4. Other jobsite signage is not permitted.

I. Collection and Disposal of Wastes:
   1. General: Establish a system for daily collection and disposal of waste materials from construction areas and elsewhere on the site. Enforce requirements strictly. Do not hold collected materials at the site longer than seven (7) days during normal weather or three (3) days when the daily temperature is expected to rise above 80 degrees F (27 degree C). Handle waste materials that are hazardous, dangerous, or unsanitary separately from other inert waste by containerizing appropriately. Dispose of waste material in a lawful manner.

3.03 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Site Enclosure Fence for Green Site: Specify that before construction operations begin, an enclosure fence with lockable entrance gates be erected. Drawing to indicate enclosure of entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

B. Select Enclosure Fence for Alternatives and Additions: Specify enclosure of new construction and sufficient area to accommodate construction operation. Means of egress and fire lane to be kept open and free of construction activity.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

3.04 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary services and facilities at the site. Limit availability of temporary services and facilities to essential and intended uses to minimize
waste and abuse. Do not permit temporary installations to be abused or endangered. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on the Project site.

B. Maintenance: Operate and maintain temporary services and facilities in good condition throughout the time of use and until removal is authorized.

C. Termination and Removal: Unless the Architect/Engineer requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it or a substantial portion of it has ended, or when it has been replaced by the permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactory repaired.

END OF SECTION
SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

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

1.02 SUMMARY
A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
B. Related Requirements:
   1. Section 01 2100 "Allowances" for products selected under an allowance.
   2. Section 01 2300 "Alternates" for products selected under an alternate.
   3. Section 01 2500 "Substitution Procedures" for requests for substitutions.

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

1.04 ACTION SUBMITTALS
A. Comparable Product Requests: Submit request for consideration within 15 days after the date of the Contract of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Section 01 25 00 "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
1.05 QUALITY ASSURANCE

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

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

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

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

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
C. Submittal Time: Comply with requirements in Section 01 70 00 “Closeout Procedures.”

PRODUCTS

2.01 PRODUCT SELECTION PROCESS

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   6. Or Equal: For products specified by name and accompanied by the term or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements.
   4. Manufacturers:
      a. Restricted List: Where Specifications include a list of names of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of available manufacturers provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
   5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product is available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Submittal: Within fifteen (15) calendar days after the date of the Contract, submit two copies to the Architect and one copy to the Owner, substitute products and materials which are proposed for installation in accordance with Section 01 25 00 "Substitution Procedures."

2. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

4. Evidence that proposed product provides specified warranty.

5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

6. Samples if requested.

PART 3 - EXECUTION

END OF SECTION
SECTION 01 6600
STORAGE AND PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Provisions established within the General and Supplementary General Conditions of the
      Contract, Division 01 - General Requirements, and Drawings are collectively applicable to this
      Section.

1.02 REQUIREMENTS INCLUDED
   A. Storage, General.
   B. Enclosed Storage.
   C. Exterior Storage.
   D. Maintenance Storage.

1.03 RELATED REQUIREMENTS
   A. Section 01 11 00 - Summary of Work.
   B. Section 01 50 00 - Temporary Facilities and Controls: Storage facilities. Protection of installed
      work.
   C. Section 01 60 00 - Product Requirements
   D. Section 01 78 43 - Project Record Documents.

1.04 SUBMITTALS
   A. See Section 01 3000 – Administrative Requirements for submittal procedures.
   B. Shop Drawings: Identify areas to be utilized as Laydown and staging Areas for construction
      materials required for the Design-Build Work.
      1. Indicate boundary fences
      2. Indicate storm water management plan.
      3. Indicate proposed transportation of materials from area to Design-Build Work site
      4. Provide means of protection of both site and adjacent properties including coordination
         required for any existing infrastructure including but not limited to automatic sprinkler
         systems

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 STORAGE, GENERAL
   A. Store products, immediately on delivery, in accordance with manufacturer’s instructions, with
      seals and labels intact. Protect until installed.
   B. Arrange storage in a manner to provide access for maintenance of stored items and for
      inspection.

3.02 ENCLOSED STORAGE
   A. Store products, subject to damage by the elements, in substantial weathertight enclosures.
   B. Maintain temperature and humidity within ranges stated in manufacturer’s instructions
   C. Provide humidity control and ventilation for sensitive products as required by manufacturer’s
      instructions.
   D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
3.03 EXTERIOR STORAGE
   A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
   B. For products subject to discoloration or deterioration from exposure to elements, cover with impervious sheet material. Provide ventilation to avoid condensation.
   C. Store granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
   D. Provide surface drainage to prevent erosion and ponding of water.
   E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.04 MAINTENANCE OF STORAGE
   A. Periodically inspect stored products on a scheduled basis.
   B. Verify that storage facilities comply with manufacturer’s product storage requirements.
   C. Verify that manufacturer’s required environmental conditions are maintained continually.
   D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

3.05 MAINTENANCE OF EQUIPMENT STORAGE
   A. For mechanical and electrical equipment in long-term storage, provide manufacturer’s service package.
   B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a Record Document.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawing and General Provisions of Contract, including General and Supplementary Conditions and other Division 1, Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS
   A. Project close-out is the term used to describe certain collective Project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract Time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and normal termination of the Contract.
      1. Time of close-out is directly related to “Substantial Completion;” therefore, the time of close-out may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as Substantially Complete at different dates. This time variation, if any, shall be applicable to the other provisions of this Section.

   B. Close-Out submittal includes, but are not necessary limited to:
      1. Project Record Documents described in Section 01 78 39.
      2. Certification of Substantial Completion.
      3. Final Change Order, if applicable.
      4. Final Acceptance for Payment-figures to assume acceptance of Final C/O - no work or retention outstanding.
      5. Consent of Surety to Final Payment.
      7. Contractor’s Affidavit of Release of Liens.
      8. Contractor’s Affidavit of Payment of debts and claims.
     10. Subcontractor and Material Supplier’s Release and Guarantee - all blanks completed - notarized for all subcontractors and suppliers on original List of Subcontractors.
     11. Letter from Contractor advising which subcontractors or suppliers differ from originally submitted List of Subcontractors, if any, with release / guarantees, as applicable.
     12. Transmittal Listing Keys: Contractor shall prepare an itemized key list in complete detail ending in a statement that the keys were turned over, the Contractor’s signature, a line stating that the keys were received and the receiver’s signature. Copies of this list should be retained by the Contractor and receiver and a copy sent to the Architect and OPS. Keys should be identified with tags corresponding to the approved room number designation.
     13. Letter from Architect that all Punch List Items have been completed to his satisfaction and recommendation regarding liquidated damages, if applicable.
     14. Operating, Instruction and Maintenance Manuals for Equipment (Mechanical, Electrical, Plumbing, etc.). All stamped by Consultant or Engineer as in accordance with Specifications.

   C. Final Adjustment of Accounts
      1. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
      2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

   D. Instruction: Instruct the Owner’s personnel in proper operation and maintenance of systems, equipment, and similar items, which were provided as part of the Work.
PART 2 - PRODUCTS

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

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION
   A. General: Complete the following before requesting the Architect/Engineer’s inspection for Certification of Substantial Completion, either for the entire Work or for portions of the Work. List known exceptions in the request.
      1. Prepare and submit the list required by the first sentence of paragraph 13.7.1 of the General Conditions.
      2. Within a reasonable time after receipt of the list, Architect will inspect to determine status of completion.
      3. Should the Architect determine that the Work is not Substantially Complete. The Architect promptly will so notify the Contractor, in writing, giving the reasons therefore.
      4. Remedy the deficiencies and notify the Architect when ready for reinspection.
      5. The Architect will reinspect the work. When the Architect concurs that the Work is Substantially Complete. The Architect will prepare a “Certificate of Substantial Completion” on AIA form G704, accompanied by the Contractor’s list of items to be completed or corrected, as verified by Architect.
      6. The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

3.02 FINAL ACCEPTANCE
   A. General: Complete the following before requesting the Architect/Engineer’s final inspection for Certification of Final Acceptance, and Final Payment as required by the General Conditions. List known exceptions, if any, in the request.
      1. Prepare and submit the notice required by the first sentence in Paragraph 13.8.1 of General Conditions.
      2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 13.8.2 of the General Conditions.
      3. Certify that:
         a. Work has been inspected for compliance with the Contract Documents.
         b. Work has been completed in accordance with the Contract Documents.
         c. Equipment and systems have been tested, as required, and are operational.
         d. Work is completed and ready for final inspection.
      4. The Architect will schedule an inspection to verify status of completion.
      5. Should the Architect determine that the Work is incomplete or defective:
         a. The architect promptly will notify the Contractor, in writing, listing the incomplete or defective work.
         b. Remedy the deficiencies promptly, and notify the Architect when ready for reinspection.
         c. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make close-out submittals.

3.03 FINAL CLEANING
   A. General: Special cleaning requirements for specific units of work are included in the appropriate Section of Divisions 2 through 16. The General Conditions requires general cleaning during the regular progress of the Work.
      1. Use experienced workmen, or professional cleaners for final cleaning.
      2. At completion of construction and just prior to acceptance or occupancy, conduct a final inspection of exposed interior and exterior surfaces.
3. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior surfaces.
4. Repair, patch and touch-up marred surfaces to match adjacent finishes.
6. Clean ducts, blowers, and coils if air conditioning units were operated during construction.
7. Sweep and buff resilient floors and base.
8. Dust all walls, metal, wood and similar finished materials.
9. Clean all cabinet and casework.
10. Dust and wash all plumbing and electrical fixtures. Remove stickers from plumbing fixtures.
11. Wash and buff or polish all non-resilient materials.
12. Vacuum carpet floors.
13. Vacuum all floor areas scheduled to receive floor finish by others.
14. Wash and polish all glass, inside and out.
15. Replace broken or scratched glass with new glass.
16. Remove waste, foreign matter, and debris from roofs gutter, area ways and drainage systems.

B. Remove temporary protection and labels not required to remain.
C. Clean permanent filters of ventilating equipment and replace all disposable filters and clean ducts, blowers and coils when units have been operated without filters.
D. Clean plumbing fixtures and food service equipment and replace disposable filters.
E. Maintain cleaning until Final Completion.

END OF SECTION
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PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and General Provisions of Contract, including General and Supplementary
      Conditions and other Division 1, Specification Sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK
   A. Definitions: “Cutting and Patching” includes cutting into existing construction to provide for the
      installation or performance of other Work and subsequent fitting and patching required to
      restore surfaces to their original conditions.
   B. “Cutting and Patching” is performed for coordination of the Work, to uncover work for access or
      inspection, to obtain samples for testing, to permit alternations to be performed, or for other
      similar purposes.
   C. Cutting and Patching performed during the manufacture of products, or during the initial
      fabrication, erection or installation processes is not considered to the “Cutting and Patching”
      under this definition. Drilling of holes to install fasteners and similar operations are also not
      considered to be “Cutting and Patching”.
   D. “Selective Demolition” is recognized as a related-but-separate category of work, which may or
      may not require cutting and patching as defined in this Section; refer to Selective Demolition”
      Section of Division 2.

1.03 QUALITY ASSURANCE
   A. Requirements for Structural Work: Do not cut and patch structural work in a manner that would
      result in a reduction of load-carrying capacity or of load-deflection ratio.
   B. Operational and Safety Limitations: Do not cut and patch operational elements or safety
      related components in a manner that would result in a reduction of their capacity to perform in
      the manner intended, including energy performance, or that would result in increased
      maintenance, or decreased operational life or decreased safety.

1.04 SUBMITTALS
   A. Procedural Proposal for Cutting and Patching: Where prior approval of cutting and patching is
      required, submit proposed procedures for this work well in advance of the time work will be
      performed and request approval to proceed. Include the following information, as applicable, in
      the submittal.
   B. List products to be used and firms that will perform work.
   C. Give dates when work is expected to be performed.
   D. List utilities that will be disturbed or otherwise be affected by work, including those that will be
      relocated and those that will be out-of-service temporarily. Indicate how long utility service will
      be disrupted.
   E. Approval by the Architect/Engineer to proceed with cutting and patching work does not waive
      the Architect/Engineer’s right to later require complete removal and replacement of work found
      to be cut and patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS
   A. General: Except as otherwise indicated, or as directed by the Architect/Engineer, the materials
      for cutting and patching shall be identical to existing materials. If identical materials are not
      available, or cannot be used, use material that match existing adjacent surfaces to the fullest
      extent possible with regard to visual effect. Use materials for cutting and patching that will
      result in equal-or-better performance characteristics.
PART 3 - EXECUTION

3.01 INSPECTION

A. Before cutting, examine the surface to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered notify the Architect immediately. Execute cutting (including excavation) fitting or patching of work required to: make several parts fit properly; uncover work to provide for installation or ill-timed work; remove and replace defective work; remove and replace work not conforming to requirements of Contract Documents.

3.02 PREPARATION

A. Temporary Support: To prevent failure provide temporary support of work to be cut.
B. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.
B. Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer’s recommendations.
C. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
D. Comply with requirements of applicable Sections of Division 2 where cutting and patching require excavating and backfilling.
E. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
F. Where feasible, inspect and test patched areas to demonstrate integrity of work.
G. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
H. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance, remove existing floor and wall coverings and replace with new materials.
I. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.

3.04 CLEANING

A. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely, point mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.
SECTION 01 7423
FINAL CLEANING

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
   A. Provisions established within the General and Supplementary General Conditions of the
      Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to
      this Section.

1.02 SECTION INCLUDES
   A. Final cleaning of project and related site work.

1.03 RELATED SECTIONS
   A. General Conditions: Clean-up.
   B. Section 01 50 00 - Temporary Facilities and Controls: Cleaning during construction.
   C. Section 01 70 00 - Project Close-Out.
   D. Individual Specification Sections: Specific cleaning for product or work.

1.04 DESCRIPTION
   A. Execute cleaning prior to inspection for Substantial Completion of Work.

PART 2 - PRODUCTS
2.01 CLEANING MATERIALS
   A. Use material which will not create hazards to health or property, and which will not damage
      surfaces.
   B. Use only materials and methods recommended by manufacturer of material being cleaned.

PART 3 - EXECUTION
3.01 CLEANING
   A. In addition to removal of debris and cleaning specified in other Sections, clean interior and
      exterior exposed-to-view surfaces.
   B. Remove temporary protection and labels not required to remain.
   C. Clean finishes free of dust, stains, films, and other foreign substances.
   D. Clean transparent and glossy materials to a polished condition; remove foreign substances.
   E. Vacuum clean carpeted and similar soft surfaces.
   F. Clean, damp mop, wax and polish resilient and hard-surface floor as specified.
   G. Clean surfaces of equipment; remove excess lubrication.
   H. Clean plumbing fixtures, and food service equipment and replace disposable filters when units
      have been operated during construction.
   I. Clean permanent filters of ventilating equipment and replace disposable filters when units have
      been operated during construction; in addition, clean ducts, blowers, and coils when units have
      been operated.
   J. Clean light fixtures and lamps.
   K. Maintain cleaning until Final Completion.
   L. Remove waste, foreign matter, and debris from roofs gutters, area ways, and drainage
      systems.
   M. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills,
      and foreign substances from paved areas and sweep clean. Rake clean other exterior
      surfaces.

END OF SECTION
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PROCEDURES - FINAL ACCEPTANCE OF CONSTRUCTION PROJECT

School: OPS Burke High School  
Project Architect: Holland Basham Architects  
Project Contractor: 

1. Letter received from Project Architect Certifying  
   a. Completion according to plans and specifications  
   b. Punch List item  

2. Affidavit received from Contractor certifying that all bills are paid on file.  

3. Certificate of Occupancy from the Contractor (new construction only) on file.  

4. OPS inspection team composed of the following, inspected the project: (Please sign below)  
   - Assistant Superintendent Department of Business Services  
   - Director, Building & Grounds  
   - Contractor Representative  
   - Jacobs Facilities, Inc. Project Manager  
   - Project Architect  

5. Final application for retainage submitted by Contractor.  

6. Consent of Surety for Final Payment  

7. District authorized carrier notified  

8. Board authorized final payment  

Above items coordinated by: 

END OF SECTION
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PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY:
   A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
      1. Operation and maintenance documentation directory.
      2. Emergency manuals.
      3. Operation manuals for systems, subsystems, and equipment.
      4. Product maintenance manuals.
      5. Systems and equipment maintenance manuals.

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

1.04 CLOSEOUT SUBMITTALS:
   A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
      1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
      2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
   B. Format: Submit operations and maintenance manuals in the following format:
         a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
         b. Enable inserted reviewer comments on draft submittals.
      2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
   C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
   D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
      1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PRODUCT

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY:
   A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS:

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

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of School & Project.
   3. Name and address of School.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Architect.
   7. Name and contact information for Commissioning Authority.
   8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required. Index documentation with a table of contents.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in maximum thickness of 3-inches, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title “OPERATION AND MAINTENANCE MANUAL,” Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS:

   A. Content: Organize manual into a separate section for each of the following:
      1. Type of emergency.
      2. Emergency instructions.
      3. Emergency procedures.
   
   B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
      1. Fire.
      2. Flood.
      5. Power failure.
      7. System, subsystem, or equipment failure.
      8. Chemical release or spill.
   
   C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

   D. Emergency Procedures: Include the following, as applicable:
      1. Instructions on stopping.
      2. Shutdown instructions for each type of emergency.
      3. Operating instructions for conditions outside normal operating limits.
      4. Required sequences for electric or electronic systems.
      5. Special operating instructions and procedures.
2.04 2.4 OPERATION MANUALS:

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUALS:

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS:

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION:

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION
PART 1 - GENERAL

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

1.02 SECTION INCLUDES
   A. Preparation and submittal of warranties and bonds.

1.03 RELATED SECTIONS/DOCUMENTS
   A. Instruction to Bidders: Bid Bonds.
   B. General Conditions: Performance Bond and Labor and Material Payment Bonds, Warranty, and Correction of Work.
   C. Section 01 70 00 - Project Close-Out.
   D. Section 01 78 23 - Operation and Maintenance Data.
   E. Individual Specification Sections: Warranties and bonds required for specific Products or Work.

1.04 FORM OF SUBMITTALS
   A. Bind in commercial quality 8-1/2 x 11 inch three-ringed binders, with hardback, cleanable plastic covers.
   B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor; name of responsible principal.
   C. 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.
   D. Separate each warranty or bond with index tab sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.05 PREPARATION OF SUBMITTALS
   A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within fourteen calendar (14) days after completion of applicable item of Work. Except for items put into use with Owner’s permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined. Warranties shall commence on the Date of Substantial Completion.
   B. Verify that documents are in proper form, contain full information, and are notarized.
   C. Co-sign all submittals. Contractor is responsible for coordination and completion of all warranty work during two (2) year warranty period.
   D. Retain warranties and bonds until time specified for submittal.

1.06 TIME OF SUBMITTALS
   A. All warranty periods start at Final Project Substantial Completion. Provide extended warranties for scope of work put into service or use prior to Final Project Substantial Completion for phasing or other use.
   B. For equipment or component parts of equipment put into service during construction with Owner’s permission, submit documents within ten (10) days after acceptance.
   C. Make other submittals within fourteen (14) calendar days after date of Substantial Completion, prior to final Application for Payment.
D. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within fourteen (14) calendar days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION
SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY:
   A. Section includes Administrative and Procedural Requirements for Project Record Documents, including the following:
      1. Record Drawings.
      2. Record Specifications.
      3. Record Product Data.
      4. Warranty Spreadsheet
      5. Operations and Maintenance Manuals (O&Ms)
      6. Miscellaneous record submittals.

1.03 CLOSEOUT SUBMITTALS
   A. Record Drawings: Comply with the following:
      1. Number of Copies:
         a. Final Submittal:
            1) Submit one paper-copy set(s) of marked-up record prints.
            2) Submit record digital data files and three set(s) of record Digital data file plots.
            3) Plot each drawing file, whether or not changes and additional information were recorded.

   B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

   C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
      1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

   D. Warranty Spreadsheet: Submit Excel Spreadsheet of all Project Warranties. List Material, and Installations by specification section. Include columns for:
      1. Specification Section Reference (# & paragraph)
      2. Specification Section Title
      3. Manufacturer
      4. Installer (Company)
      5. Company/Manufacturer Contact with phone Number
      6. Warranty Duration

   E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS:
   A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and reviewed Shop Drawings at the jobsite, incorporating new and revised drawings as modifications are issued.
      1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: Annotated PDF electronic file with comment function enabled.
   2. Incorporate changes and additional information previously marked on record prints.
   3. Refer instances of uncertainty to Architect for resolution.
      a. See Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Annotated PDF electronic file with comment function enabled.
   3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
   4. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
2.02 RECORD SPECIFICATIONS:
A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders, record Product Data, and record Drawings where applicable.
B. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.03 RECORD PRODUCT DATA:
A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, record Specifications, and record Drawings where applicable.
B. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.04 MISCELLANEOUS RECORD SUBMITTALS:
A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
   1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

2.05 OPERATIONS AND MAINTENANCE MANUALS:
A. Sets: Provide two (2) bound copies and one (1) electronic (PDF) copy.

2.06 WARRANTIES:
A. Sets: Provide two (2) bound copies and one (1) electronic (PDF) copy.

PART 3 - EXECUTION
3.01 RECORDING AND MAINTENANCE:
A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use the project record documents for construction. Maintain record documents in good order and in a clean,
dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 REQUIREMENTS INCLUDED
   A. Products required.
   B. Storage and delivery of products.

1.03 RELATED REQUIREMENTS
   A. Section 01 66 00 - Storage and Protection.
   B. Section 01 70 00 - Project Close-Out.
   C. Section 01 78 23 - Operations and Maintenance Data.
   D. Individual Specifications Sections: Specific spare part and materials required.

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

1.05 STORAGE, MAINTENANCE
   A. Store products with products to be installed in the Work, under provisions of Section 01 60 00 Product Requirements.
   B. When adequate, secure storage facilities available at site, capable of maintaining conditions required for storage and not required for Contract work or storage, or for Owner’s needs, spare products may be stored in available space.
   C. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

1.06 DELIVERY
   A. Coordinate with Owner: Deliver and unload spare products to Owner at Project Site and obtain receipt prior to Final Payment.
   B. For portions of Project accepted and occupied by Owner prior to Substantial Completion, deliver a proportional part of spare products to Owner; obtain receipt.

PART 2 - PRODUCTS - (NOT APPLICABLE)
PART 3 - EXECUTION

END OF SECTION
EXISTING CONDITIONS
SECTION 02 4100
DEMOLITION

PART 3 EXECUTION

1.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

1.02 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.
B. Leave site in clean condition, ready for subsequent work.
C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION
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CONCRETE
SECTION 03 3511
CONCRETE FLOOR FINISHES

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Surface treatments for concrete floors and slabs.
B. Liquid densifiers and hardeners.

1.02 RELATED REQUIREMENTS
A. Section 01 8113 - Sustainable Design Requirements: General requirements and submittal procedures relating to achieving LEED certification.
B. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.
C. Section 03 3000 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 REFERENCES
A. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordinate the work with concrete floor placement and concrete floor curing.
B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.
C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.06 QUALITY ASSURANCE
A. For slabs indicated to receive concrete polishing system, do not proceed with concrete polishing unless manufacturer's representative and specialized equipment is present for every day of placement.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.07 MOCK-UP
A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
B. Mock-Up Size: 10 feet square.
C. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.09 FIELD CONDITIONS
A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
B. Do not finish floors until interior heating system is operational.
C. Maintain ambient temperature of 50 degrees F minimum.
D. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

E. Contractor will be responsible for providing disposal of slurry and finish by products in compliance will all applicable codes.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Unless otherwise indicated, all concrete floors are to be finished using liquid densifier/hardener.

B. Hardening/Sealing Agent:
   1. Use at following locations: All areas to receive polished finish.

C. Sealer:
   1. Use at following locations: All areas to receive polished finish.

D. Polished Finish:
   1. Use at following locations: Where indicated on the drawings.

2.02 DENSIFIERS AND HARDENERS

A. Hardening/Sealing Agent: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
   1. Abrasion Resistance: ASTM C779 - Up to 400% increase in abrasion resistance.
   2. Impact Strength: ASTM C805 - Up to 21% increase in impact strength.
   4. Reflectivity: Up to 30% increase in reflectivity.
   5. Basis of Design Product:
      a. Advanced Floor Products, Inc; Retro-Plate 99: www.retroplatesystem.com.
      b. Other Acceptable Products:
         2) Substitutions: Not permitted.

2.03 COATINGS

A. Sealer: Penetrating, UV-stable stain preventing, coating.
   1. Composition: modified acrylic.
   2. Basis of Design Product:
      b. Other Acceptable Products:
         2) Substitutions: Not permitted.

2.04 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Acceptable Systems:
      a. Advanced Floor Products, Inc; RetroPlate Concrete Polishing System: www.retroplatesystem.com.
      b. Other Acceptable Systems:
         2) Substitutions: Not permitted

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.
B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

C. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

D. Prior to application, verify that floor surfaces are free of construction latents.

3.02 GENERAL
A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION
A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

3.04 CONCRETE POLISHING
A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
   1. Final Polished Sheen: Satin finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
   2. Satin Finish: Reflecting images from side lighting.
   3. Concrete must be in place a minimum of 28 days or as directed by the manufacturer before application can begin.
   4. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen. In addition, lack of adherence to F(f) flatness and levelness specifications can increase the mottled appearance and irregular exposure of aggregate.
   5. Finish to within 1/2 inch of vertical surfaces where practical.
   6. Polish to “Level 1” low gloss finish, with a Class B fine aggregate “salt and pepper” aggregate exposure.

B. Protect finished surface as required and as recommended by manufacturer of polishing system.

3.05 PROTECTION
A. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
   1. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
   2. No trade will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
   3. No pipe cutting machine will be used on the inside floor slab.
   4. Steel will not be placed on interior slab to avoid rust staining.

END OF SECTION
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PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Concrete block.
   B. Clay facing brick.
   C. Mortar and grout.
   D. Reinforcement and anchorage.
   E. Flashings.
   F. Accessories.
1.02  RELATED REQUIREMENTS
   A. Section 07 9200 - Joint Sealants:  Sealing control and expansion joints.
1.03  REFERENCE STANDARDS
   A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel
      Hardware; 2016a.
      Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2022b.
   C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for
      Concrete Reinforcement; 2022.
   D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire;
      2019.
   E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement;
      2022.
   F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire
      Reinforcement, Plain and Deformed, for Concrete; 2022.
      Tile; 2021.
   I. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2022.
   L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or
      Shale); 2022.
   M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial
      Revision.
   P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete;
      2016.
   Q. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in
      Roofing and Waterproofing; 2017 (Reapproved 2023).
   U. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry
      Construction; International Masonry Industry All-Weather Council; current edition.
   V. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry
      Construction; International Masonry Industry All-Weather Council; current edition.
1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. **Product Data:** Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. **Manufacturer's Certificate:** Certify that masonry units meet or exceed specified requirements.

### 1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. **Installer Qualifications:** Company specializing in performing work of the type specified and with at least three years of documented experience.

1. Masons must be a member of the Nebraska Masonry Association.

### 1.06 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 PRODUCTS

#### 2.01 CONCRETE MASONRY UNITS

A. **Concrete Block (CMU):** Comply with referenced standards and as follows:

1. **Size:** Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.

2. **Special Shapes:** Provide nonstandard blocks configured for corners.
   a. Provide square-edged units for exposed outside corners.

3. **Load-Bearing Units:** ASTM C90, normal weight.
   a. Hollow block unless indicated otherwise.
   b. Exposed Faces: Special color and texture where indicated, as follows:
      1) Texture: Split Faced
      2) Color: Architect to choose from samples provided.

B. **Concrete Brick:**

1. **Size:** As indicated on drawings.

#### 2.02 BRICK UNITS

A. **Manufacturers:**

1. Endicott Clay Products Co; Face Brick - FBX: www.endicott.com/#sle.
   a. Match existing

2. Substitutions: See section 01 6000 - Product Requirements.

B. **Facing Brick:** ASTM C216, Type FBS Smooth, Grade SW.

1. **Nominal size:** As indicated on drawings.

2. **Special shapes:** Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

3. **Compressive strength:** 2,500 psi, measured in accordance with ASTM C67/C67M.

#### 2.03 MORTAR AND GROUT MATERIALS

A. **Portland Cement:** ASTM C150/C150M, Type I; color as required to produce approved color sample.

1. **Hydrated Lime:** ASTM C207, Type S.

2. **Grout Aggregate:** ASTM C404.

B. **Pigments for Colored Mortar:** Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

C. **Water:** Clean and potable.

D. **Accelerating Admixture:** Nonchloride type for use in cold weather.

#### 2.04 REINFORCEMENT AND ANCHORAGE

A. **Manufacturers:**


4. WIRE-BOND

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

D. Strap Anchors: Bent steel shapes size as indicated on the drawings, hot dip galvanized to ASTM A153/A153M, Class B-2.

E. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   1. Concrete frame: Dovetail anchors, 12 gage thick slot anchors, with trapezoidal wire ties 0.1875 inch diameter, hot dip galvanized to ASTM A153/A153M, Class B-2.
   2. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A153/A153M, Class B.

F. Adjustable Wall Tie Between Concrete Block and Masonry Veneer: Formed steel wire 0.1875 inch diameter, eye and pintle type, hot dip galvanized to ASTM A153/A153M, Class B-2.

G. Horizontal Joint Reinforcement Tie Between Concrete Block and Masonry Veneer In Lieu of Adjustable Wall Ties:
   1. Provide ladder type with perpendicular cross rods at 16 inches on center with one side rod for veneer and two side rods for block back-up wall.

H. Masonry Veneer Anchors to Metal or Wood Stud Framing: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A153/A153M, Class B-2.
   1. Anchor plates: Not less than 0.0785 inch thick, designed for fastening to structural backup through sheathing by two screws; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Triangular shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.
   4. Screws shall be type specifically recommended by anchor manufacturer, corrosion resistant, extending through the exterior sheathing into the stud.

2.05 FLASHINGS

A. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
   1. Manufacturers:
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Stainless Steel/Polymer Fabric Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.
   1. Manufacturers:
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.

D. Flashing Sealant/Adhesive: Butyl type as specified in Section 07 9200.

E. Termination Bars: Stainless steel; compatible with membrane and adhesives.
2.06 ACCESSORIES
A. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; three inch wide by maximum lengths available.

B. 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: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products Inc; Mortar Break: www.advancedbuildingproducts.com/#sle.
         3) Substitutions: See Section 01 6000 - Product Requirements.

C. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

D. Nailing Strips: Softwood lumber, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

E. Weeps:
   1. Type: Molded PVC grilles, insect resistant.
   2. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Cavity Vents:
   1. Type: Molded PVC grilles, insect resistant.
   2. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXING
A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. All masonry: Type S.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

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 PREPARATION
A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
3.03 COLD AND HOT WEATHER REQUIREMENTS
A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 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:
D. Brick Units:

3.05 PLACING AND BONDING
A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
D. Remove excess mortar and mortar smears as work progresses.
E. Interlock corners, except for units laid in stack bond.
F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
H. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks as indicated.

3.06 WEEPS/CAVITY VENTS
A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels, at bottom of walls, and above through-wall flashing.
B. Install cavity vents in veneer and cavity walls at 24 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL
A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
B. 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.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTE MASONRY, AND CAVITY WALL MASONRY
A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.
3.09 GROUTED COMPONENTS
A. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
B. Place and consolidate grout fill without displacing reinforcing.
C. At bearing locations, fill masonry cores with grout for extent shown on the drawings at both sides of the opening.
D. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.
E. Limit height of pours to 4 feet - 8 inches.
F. Pour grout only after vertical reinforcing is in place.
G. Place grout for each pour continuously and consolidate immediately; do not interrupt pour for more than 1-1/2 hours.

3.10 CONTROL AND EXPANSION JOINTS
A. Do not continue horizontal joint reinforcement through control or expansion joints.
B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Size control joints as indicated on drawings; if not indicated, 3/8 inch wide and deep.
E. Form expansion joint as detailed on drawings.

3.11 BUILT-IN WORK
A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
B. Install built-in items plumb, level, and true to line.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 8 inches from framed openings.
D. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES
A. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.
B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING
A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. 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.

3.14 CLEANING
A. Remove excess mortar and mortar droppings.
B. Replace defective mortar. Match adjacent work.
C. Clean soiled surfaces with cleaning solution.
D. Use non-metallic tools in cleaning operations.
3.15 PROTECTION
   A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION
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METALS
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SECTION 05 5100
METAL STAIRS

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Structural steel stair framing and supports.
   B. Handrails and guards, for all applications both interior and exterior.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

1.03 REFERENCE STANDARDS
   E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
   O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
   P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
   Q. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
      1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
      2. Include the design engineer’s seal and signature on each sheet of shop drawings.
   C. Welders’ Qualification Statement: Welders’ certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE
   A. Comply with ADA Standards and ICC A117.1.
B. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.

2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.

   1) Accommodate expansion and contraction of members and building movement without damage to connections or members.

3. Dimensions: As indicated on drawings.

4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.

5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 HANDRAILS AND GUARDS

A. Handrails (both wall and guard mounted): Round pipe or tube rails unless otherwise indicated.

B. Guards:

   1. Top Rails: Round pipe or tube rails unless otherwise indicated.

   2. End and Intermediate Posts: Same material and size as top rails.

      a. Horizontal Spacing: As indicated on drawings.

      b. Mounting: Welded to top surface of stringer.

2.03 MATERIALS

A. Steel Sections: ASTM A36/A36M or ASTM A992.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.

   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).

   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G60/Z180 coating.

F. Tread and Landing Concrete Reinforcement: As detailed.

2.04 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.
   1. Series 90-97 at exterior stair locations.
   2. Series 10-99G at all other locations.
D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.05 SHOP FINISHING
A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION
A. Install components plumb and level, accurately fitted, free from distortion or defects.
B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
F. Obtain approval prior to site cutting or creating adjustments not scheduled.
G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
H. Install handrails and guards as detailed on drawings.

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

END OF SECTION
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B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
C. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

2.03 FABRICATION
A. Accurately form components to suit specific project conditions and for proper connection to building structure.
B. Fit and shop assemble components in largest practical sizes for delivery to site.
C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
D. Welded Joints:
E. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
F. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
G. 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.

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 items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
C. Anchor railings securely to structure.
D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.
E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES
A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
PART 2 PRODUCTS

1.01 RAILINGS - GENERAL REQUIREMENTS
   A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
   B. Allow for expansion and contraction of members and building movement without damage to connections or members.
   C. Dimensions: See drawings for configurations and heights.
   D. Provide anchors and other components 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.
   E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

1.02 FABRICATION
   A. Accurately form components to suit specific project conditions and for proper connection to building structure.
   B. Fit and shop assemble components in largest practical sizes for delivery to site.
   C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

END OF SECTION
SECTION 05 7500
DECORATIVE FORMED METAL

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Exterior & Interior fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Closures, trim, and filler panels.
   2. Metal base.

1.02 RELATED REQUIREMENTS
A. Section 05 5000 - Metal Fabrications: Non-decorative metal fabrications.
B. Section 09 9000 - Painting.

1.03 REFERENCE STANDARDS
F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data - Sheet Metal Material: 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.
   4. Specimen warranty.
C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Differentiate between shop and field fabrication.
   2. Indicate substrates and adjacent work with which the fabrications must be coordinated.
   3. Include large-scale details of anchorages and connecting elements.
4. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.

D. Verification Samples: For each finish product specified, minimum size 12 inches square, representing actual product in color and texture.

E. Maintenance Data: Care of finishes and warranty requirements.

1.05 QUALITY ASSURANCE
A. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
   1. Locate where directed.
   2. Provide products finished as specified.
   3. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Perforated Metal Panel Manufacturers:
   2. Substitutions: See Section01 6000-Product Requirements.

2.02 FORMED METAL FABRICATIONS - GENERAL
A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.
G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.

2.03 FORMED METAL FABRICATIONS - PERFORATED METAL PANEL

A. Perforated Metal Panel
   1. Material: Carbon Steel
   2. Finish: Painted, provide color samples to architect for selection
   3. Hole Pattern: 1/8" x 1" Round-End Slot, Side Staggered
   4. Thickness: 16 Gauge (.0598" Thick)

B. Closures, Trim and Fill Panels:
   1. Form closures from type and thickness of metal indicated.
   2. Conceal fasteners when possible.
   3. Drill and tap holes for securing to other surfaces.
   4. Provide gaskets where indicated or needed for continuous seal at adjacent surfaces.
   5. Miter or cope at corners and reinforce with bent metal plate. Form tight joints.

C. Metal Base: Form metal base from type and thickness of metal indicated. Provide integral cove, reveals and other features shown on drawings.

2.04 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Anchors, Clips and Accessories: Use one of the following:
   2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
   3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 35.
   4. Interior Locations: Carbon steel; zinc coated in accordance with ASTM B633 or ASTM F1941/F1941M Class Fe/Zn 5.
   5. Exterior Locations or in Contact with Stainless Steel:
   6. Structural Anchors: Provide anchors where work is indicated to comply with design loads. 
      a. Type: Provide chemical or torque-controlled expansion anchors.
      b. Capacity: When tested according to ASTM E488/E488M; four times the load imposed when installed in concrete.
   7. Nonstructural Anchors: Provide powder-actuated fasteners where work is not indicated to comply with design loads. Provide size and number required for load, installation, and as recommended by manufacturer, unless indicated otherwise.

C. Fasteners, General: Same basic metal and alloy as formed metal sheet unless indicated otherwise. Do not use metals incompatible with the materials joined.

D. Gaskets: As required to seal joints in decorative formed metal and remain airtight; as recommended in writing by decorative formed metal manufacturer.

2.05 FINISHES

A. Finishes, General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not
acceptable. Install components within range of approved samples to minimize contrast.

B. Steel Finishes:
   1. Powder-Coat Finish: Manufacturer's standard thermosetting polyester or acrylic urethane powder coating; minimum cured-film thickness of 1.5 mils.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify dimensions, tolerances, and interfaces with other work.
   B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
   C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
   D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION
   A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION - SHEET METAL AND PLATE FABRICATIONS
   A. Locate and place decorative formed sheet metal items level and plumb; align with adjacent construction. Cut, drill and fit as required to install.
   B. Do not cut or abrade sheet metal finishes that cannot be completely restored in the field. Return such items to manufacturer or fabricator for required alterations and refinishing or provide new items.
   C. Use concealed anchorages where possible. Provide washers where needed on bolts or screws to protect metal surfaces and make weathertight connection.
   D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers indicated.

3.04 CLEANING
   A. Restore finishes damaged during installation and construction period. Return items that cannot be refinished in the field to manufacturer or fabricator. Refinish entire unit or provide new units.
   B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
   C. Remove temporary coverings and protection of adjacent work areas.
   D. Clean installed products in accordance with manufacturer's instructions.

3.05 PROTECTION
   A. Protect installed products from damage during construction.

END OF SECTION
WOOD, PLASTICS AND COMPOSITES
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PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Nonstructural dimension lumber framing.
   B. Sheathing.
   C. Roof-mounted curbs.
   D. Roofing nailers.
   E. Preservative treated wood materials.
   F. Fire retardant treated wood materials.
   G. Communications and electrical room mounting boards.
   H. Miscellaneous wood nailers, furring, and grounds.

1.02  RELATED REQUIREMENTS
   A. Section 06 1219 - Structural Insulated Panels.
   B. Section 06 1323 - Heavy Timber Framing.
   C. Section 06 1326 - Heavy Timber Trusses.
   D. Section 06 1500 - Wood Decking.
   E. Section 06 1733 - Wood I-Joists.
   F. Section 06 1736 - Metal-Web Wood Joists.
   G. Section 06 1753 - Shop-Fabricated Wood Trusses.
   H. Section 06 1800 - Glued-Laminated Construction.

1.03  REFERENCE STANDARDS
   B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
   E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
   I. PS 1 - Structural Plywood; 2019.

1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Provide technical data on insulated sheathing, fire retardant treatment products, wood preservative materials, fire retardant treatment products, application instructions, fire retardant treatment products, and fire retardant treatment products.
   C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

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.
B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

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 species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
      a. Any species allowed under grading rules, unless otherwise indicated.
      b. Western cedar in contact with roofing, waterproofing, masonry, concrete, galvanized metal, or at exterior wall penetrations.

2.02 STRUCTURAL COMPOSITE LUMBER

A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Any PS 2 type, APA rated Sheathing.
   1. Products:
      e. Substitutions: See Section 01 6000 - Product Requirements.
C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A153/A153M or Stainless steel for exterior, high humidity, fire retardant, preservative treated, cedar, and redwood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type None - N/A.
   3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
E. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

PART 3 EXECUTION
3.01 PREPARATION
A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
B. 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.

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. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.
F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
G. Provide bridging at solid joists or I-joists in excess of 8 feet span at 8 foot intervals. Fit solid blocking or bridging at ends of members.
H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.
   1. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
I. Construct corners and intersections with three or more studs. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
   1. Fire block concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where fire blocking is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal thick lumber of same width as framing members.
   2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
C. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
3. Handrails.
4. Wall-mounted door stops.
5. Chalkboards and marker boards.
6. Wall paneling and trim.
7. Joints of rigid wall coverings that occur between studs.
8. Owner provided fixtures or equipment.

3.05 ROOF-RELATED CARPENTRY
A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.
C. Provide cedar or redwood wood blocking within roof assembly as detailed on the drawings.

3.06 INSTALLATION OF CONSTRUCTION PANELS
A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.07 TOLERANCES
A. Framing Members: 1/4 inch from true position, maximum.
B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING
A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
SECTION 06 4100
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 09 0600 - Color Schedule: Plastic Laminate manufacturer, color and finish and Solid Surfacing manufacturer, color, finish and thickness.

1.03 REFERENCE STANDARDS
E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
F. BHMA A156.9 - Cabinet Hardware; 2020.
G. {RSTEMP#10003128}
H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
C. Product Data: Provide data for hardware accessories.
D. Samples: Submit two of each finish material specified, 6 by 6 inch in size, illustrating cabinet finish and counter top finish.

1.05 QUALITY ASSURANCE
A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
B. Optimum Moisture Content: Kiln-dry woodwork to an average moisture content within ranges recommended by applicable Quality Standards for the regional climatic conditions involved.

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 CABINETS
A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
B. Cabinets:
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Melamine, unless otherwise noted.
   4. Finish - Concealed Surfaces: Manufacturer’s option.
   5. Door and Drawer Front Edge Profiles: Square edge, 3mm PVC edge banding.
7. Drawer Side Construction: Multiple-dovetailed, Baltic Birch.

2.02 WOOD-BASED COMPONENTS
A. Wood fabricated from old growth timber is not permitted.
B. Provide materials that comply with requirements of the AWI Woodworking Standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
1. Hardboard: ANSI/AHA A 135.4
5. Softwood Plywood: PS 1
7. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
   c. Hardwood Plywood: HPMA FE.

2.03 LAMINATE MATERIALS
A. Manufacturers:
   5. Substitutions: See Section 016000 - Product Requirements.
B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
   1. Color: See 09 0600 Color Schedule

2.04 COUNTERTOPS AND WINDOW STOOLS
A. Solid Polymer Fabrications: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & ANSI Z124.6, Type Six, and {RS#10003128}.
   1. Manufacturers:
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Color(s): See Section 09 0600 - Color Schedule.
   4. Thickness: 1/2"-inch, over continuous substrate.
   5. Exposed Edge Treatment: Built up to minimum 1-1/4-inch thick, eased edges.
   6. Finish: Gloss

2.05 ACCESSORIES
A. Adhesive: Type recommended by fabricator to suit application.
B. Solid Surface Polymer Fabrications Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.
C. Solid Surface Polymer Fabrications Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1, UL listed.
D. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color-matching or clear formulations.
E. Fasteners: Size and type to suit application.
F. Concealed Joint Fasteners: Threaded steel.

G. Grommets: Standard plastic, painted metal, rubber, or exposed metal grommets for cut-outs, in color to match adjacent surface.
1. Product: 3 inch diameter, "EDP" manufactured by Doug Mockett & Company, Inc.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Hinges:
1. Heavy Duty, 5 knuckle, fixed pin, hospital tip, full wrap around 270 deg swing, institutional type with minimum of 8 screw attachment. Satin Chrome finish.
   a. Doors 48 inches or less: 1 pair
   b. Doors over 48 to 72 inches: 1-1/2 pr.
   c. Doors over 72 inches: 2 pr.
      1) Doors over 72", split in half if possible to prevent warping.
2. Concealed Type (European) Hinges are not acceptable.

C. Pulls for Doors & Drawers:
1. 4" wire pull, Brushed Aluminum finish.

D. Drawer Slides:
1. Heavy-duty, full extension, side mount.

E. Locks:
1. Corbin Disk Tumblers; Catalog No. 02066, Keyed as directed by OPS (Std OPS keys are Cat – 40, Cat – 60 & Cat –70)
2. Metal strike is required. An un-reinforced slot in wood to receive bolt is not acceptable.

F. Catches:
1. Magnetic Type – Preferred
2. Roller Type: May be used with OPS preapproval.

G. Adjustable Shelf Hardware:
1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall be polycarbonate clips, 5mm dia. The support shall automatically adapts to ¾ inch or 1 inch thick shelving and provided non-tip feature for shelving. Structural load to 1200 pounds (300 pounds per support) without failure.

H. Countertop Support Brackets: Surface mounted, and concealed. Refer to Interior Elevations and Casework details.
1. Material: Steel.
2. Size: To suit application.
3. Load Capacity (per bracket): 450 lb.
4. Finish: Primed for field finish.
   a. Paint to match adjacent finished vertical surface that bracket is mounted on.

2.07 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.

C. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
3. Apply edges of doors and drawers before applying the face laminate.

D. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
E. Install two grommets per "knee space" and as indicated on the drawings. Coordinate locations with Owner.
F. Form joints between solid surfacing components using manufacturer's standard joint adhesive, joints inconspicuous in appearance and without voids. Attach 2 inch wide reinforcing strip of solid polymer material under each joint.
G. Rout and finish solid surfacing component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or replace defective or inaccurate work.
   1. Finish: Uniform on all surfaces. See Section 09 0600 - Color Schedule.

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. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
   B. Use fixture attachments in concealed locations for wall mounted components.
   C. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
   D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
   E. Secure cabinets to floor using appropriate angles and anchorages.
   F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
   G. Form field joints in solid surfacing using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

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
THERMAL AND MOISTURE PROTECTION
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SECTION 07 1800
TRAFFIC COATINGS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Waterproof coatings for traffic surfaces.

1.02 REFERENCE STANDARDS
C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Include product characteristics and limitations. Identify dissolving solvents, fuels, and potential destructive compounds.
C. Samples: Submit two verification samples of cured membrane, 24 by 24 inch in size, illustrating color, surface texture, and variations.
D. Certificate: Certify that products of this section meet or exceed specified requirements.
E. Test Reports: Submit Test Reports log within 10 days after completion of tests; include
F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
G. Manufacturer's Installation Instructions: Include special field conditions required to install traffic membrane and potential incompatibilities with adjacent materials.
H. Applicator's qualification statement.
I. Maintenance Data: Include procedures for stain removal, repairing surface, and cleaning.
J. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing installation of traffic membrane, with minimum three years documented experience.

1.05 MOCK-UPS
A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Provide 1 mock-up, 2 feet long by 2 feet wide, with traffic coating system applied to representative substrate.
C. Locate where directed.
D. Mock-up may remain as part of work.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Maintain storage area at minimum ambient temperature of 55 degrees F.
B. Keep away from fire or open flame.

1.07 FIELD CONDITIONS
A. Do not install materials when temperature is below 50 degrees F or above 90 degrees F.

1.08 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Source Limitations: Furnish all products and accessories to the greatest extent possible produced by single manufacturer and obtained from single supplier, or approved by the manufacturer provided.
B. Polyurethane Traffic Coating:
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRAFFIC COATINGS
      1. Finished Coating Thickness: 48 mil, 0.048 inch, minimum.
      2. Color: As selected by Architect.

2.03 ACCESSORIES
   A. General: Accessory materials as described in manufacturer’s written installation instructions, recommended to produce complete traffic coating system meeting performance requirements, and compatible with traffic coating material and adjacent materials.
   B. Surfacing: Clean sand.
   C. Cant Strips: 1 inch by 1 inch by 45 degrees, of dense sponge rubber compatible with adjacent materials.
   D. Sealant: As recommended by membrane manufacturer, and compatible with system and adjacent materials.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Conduct examination of substrate surfaces with applicator and manufacturer’s representative both present.
   B. Verify that substrate is ready to receive work, surface is clean, dry and free of substances that could adversely effect bond.
   C. Do not begin work until concrete substrate has cured at least 28 days and moisture content is 16 percent or less.
   D. Test concrete surfaces according to ASTM F710 for acceptable level of alkalinity.
   E. Test for calcium chloride in accordance with ASTM F1869, or moisture sensor measurements in accordance with ASTM F2170 to evaluate slab moisture prior to installing coating.

3.02 PREPARATION
   A. Clean substrate surface free of foreign matter.
   B. Patch concrete substrate with filler to produce surface conducive to bond.
   C. Install cant strips securely at intersecting surfaces.
   D. Protect adjacent surfaces.

3.03 INSTALLATION
   A. Apply system materials in accordance with manufacturer’s instructions.
   B. Apply primer to prepared substrate to a minimum dry film thickness in accordance with manufacturer’s instructions.
   C. When primer is tack free, apply one base coat of membrane to a total minimum dry film thickness in accordance with manufacturer’s instructions.
   D. When base coat is tack free, apply two coats of intermediate and top coating to a minimum dry film thickness in accordance with manufacturer’s instructions.
   E. Extend primer, base and top coats up intersecting and perimeter vertical surfaces, 4 inches. Terminate top edge in a straight line.
   F. Finish to smooth surface sloped to drains. Cove at vertical surfaces.
   G. Apply surfacing to top coat before set.
   H. Apply sealant to junction of horizontal and intersecting surfaces to achieve watertight seal.
3.04 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements for additional requirements.
   B. Manufacturer Services: Provide services of manufacturer's field representative to inspect work.
      1. Verify wet mil thickness in accordance with ASTM D4414, three readings per location.
      2. Verify adhesion in accordance with ASTM D7234, three readings every 25,000 sf, minimum 200 psi.

3.05 PROTECTION
   A. Do not permit traffic over unprotected surfaces.

END OF SECTION
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SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, exterior wall behind wall finish, interior wall with facer providing exposed finish, and fluid applied membrane waterproofing assemblies.
B. Fiberboard insulation at cavity wall construction, exterior wall behind the wall finish, and fluid applied membrane waterproofing assemblies.
C. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
D. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS
A. Section 07 2600 - Vapor Retarders: Separate vapor retarder materials.

1.03 REFERENCE STANDARDS

1.04 SYSTEM DESCRIPTION
A. Materials of This Section: Provide a complete and continuously insulated building envelope. Insulation systems shall be provided at all exterior surfaces, excluding fenestration, but including insulation, vapor retarder, air and/or water resistive barriers provided in other sections. These retarders and barriers shall be sealed to adjacent materials and at penetrations thru them.

1.05 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 Inside Masonry Cavity Walls: Expanded polystyrene (EPS) board.
B. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) carbon black board.
C. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
   1. See Section 07 2600 - Vapor Retarders.
D. Insulation Over Roof Deck: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS
A. Expanded Polystyrene (EPS) Board Insulation: Comply 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.
B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type X, 15 psi (104 kPa), minimum.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type X, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
4. Board Thickness: As indicated on the drawings.
5. Products:
   b. Owens Corning Corporation; FOAMULAR Type NGX 150 Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
   
   C. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
      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. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Formaldehyde Content: Zero.
   3. Thickness: As indicated on the drawings.
   5. Products:
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES
A. Sheet Vapor Retarder: See Section 07 2600.
B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
C. 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 FOAM BOARD INSTALLATION AT EXTERIOR WALLS
A. Apply adhesive to back of boards:
B. Install boards vertically on walls.
C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
D. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.
E. Tape insulation board joints.

3.03 FOAM BOARD INSTALLATION AT CAVITY WALLS
A. Apply adhesive to back of boards:
B. Install boards to fit snugly between wall ties.
C. Install boards horizontally on walls.
D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
3.04 BATT INSTALLATION
   A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
   B. Install in exterior wall and roof 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. Tape seal tears or cuts in vapor retarder.
   F. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.05 PROTECTION
   A. Do not permit installed insulation to be damaged prior to its concealment.
SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Foamed-in-place insulation.
   1. In exterior framed walls.
   2. At junctions of dissimilar wall and roof materials.
   3. Filling perimeter of window and door shim spaces and crevices in exterior wall and roof.
   4. In underside of floor decks.
B. Protective intumescent coating.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
C. Certificates: Certify that products of this section meet or exceed specified requirements.
D. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.05 FIELD CONDITIONS
A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Foamed-In-Place Insulation:
2.02 MATERIALS
A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open cell or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
      a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.
   2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   5. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   6. Closed Cell Content: At least 90 percent.
   7. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.03 ACCESSORIES
A. Primer: As required by insulation manufacturer.
B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.
   1. Coating Type: Single component, water-based.
   2. Protected Insulation Type: Spray polyurethane foam (SPF).
   3. Application: Apply using brush, roller, or airless sprayer.
   4. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   5. Color: As indicated on drawings.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify work within construction spaces or crevices is complete before insulation application.
B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION
A. Mask and protect adjacent surfaces from over spray or dusting.
B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION
A. Apply insulation in accordance with manufacturer's instructions.
B. Apply insulation by spray method, to a uniform monolithic density without voids.
C. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire rating required.
D. Patch damaged areas.
E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

3.04 TOLERANCES
A. Maximum Variation From Specified Thickness: Minus 0.25 inch and plus 0.50 inch.

3.05 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Field inspections and tests will be performed by an independent testing agency.
C. Inspection will include verification of insulation and protective coating thickness and density.

3.06 PROTECTION
   A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION
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PART 1  GENERAL
1.01 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.
   B. Section 07 5400 - Thermoplastic Membrane Roofing: Vapor retarder installed as part of roofing system.
1.02 DEFINITIONS
   A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.
   B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
      1. Class I: 0.1 perm or less.
      2. Class II: Greater than 0.1 perm to 1.0 perm.
      3. Class III: Greater than 1.0 perm to 10 perms.
1.03 REFERENCE STANDARDS
1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
1.05 FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2  PRODUCTS
2.01 VAPOR RETARDERS
   A. Underslab Vapor Retarders: See Section 03 3000.
   B. Vapor Retarder Sheet: Polyethylene sheeting complying with ASTM D4397, clear color.
      1. Thickness: 10 mil, 0.006 inch, nominal.
      2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M.
      3. Seam Lap and Perimeter Adhesive: Elastomeric, same composition as sheet or other compatible material.
2.02 ACCESSORIES
   A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.
   B. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.

PART 3  EXECUTION
3.01 EXAMINATION
   A. Verify that surfaces and conditions comply with requirements of this section.
3.02 PREPARATION
   A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
   B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.
3.03 INSTALLATION
A. Install materials in accordance with manufacturer's installation instructions.
B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.
C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
D. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is installed within assembly, install vapor retarder over insulation.
   2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, providing an airtight seal.
   3. Locate laps at framing members; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet in shingle fashion to shed water.
   4. Seal entire perimeter to structure, window and door frames, and other penetrations.
   5. Where conduits, pipes, wires, ducts, outlet boxes, and other items are installed within insulation cavity, pass vapor retarder sheet behind these items and over insulation to maintain airtight seal.
E. Openings and Penetrations in Exterior Vapor Retarders:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto vapor retarder and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings with nonflanged frames, seal vapor retarder to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
   4. At head of openings, install flashing under vapor retarder extending at least 2 inches beyond face of jambs; seal vapor retarder to flashing.
   5. At interior face of openings, seal gaps between window/door frame and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of vapor retarder.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
   1. Allow access to work areas and staging.
   2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
   3. Do not cover work of this section until testing and inspection is accepted.
C. Do not cover installed vapor retarders until required inspections have been completed.

3.05 PROTECTION
A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION
SECTION 07 2700
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Air barriers.

1.02 DEFINITIONS
A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
C. Shop Drawings: Provide drawings of special joint conditions.
D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
E. Installer's qualification statement.

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
B. Observation Reports by an authorized manufacturer's representative.

1.06 FIELD CONDITIONS
A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.
B. Field quality control adhesion test reports.

1.07 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Conference with all contractors associated with wall assembly and connections: Conduct conference at Project site. Review air barrier assembly installation requirements including substrate condition inspection, testing requirements, environmental conditions, mockups, details and scheduling and inspection of work.

1.08 WARRANTY
A. Special Warranty, General: Manufacturer's standard project-specific form in which manufacturer agrees to repair or replace air barrier coatings and accessory products that demonstrate deterioration or failure within warranty period specified due to material failure under normal use. Failure includes water or air penetration through air barrier assembly.
B. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)
A. Air Barrier, Fluid Applied: Vapor semi-permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Material: 100 percent silicone.
      b. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
c. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
d. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
e. Provide air barrier and all accessories required for a complete system by a single manufacturer.
f. Products:
   2) Hohmann & Barnard, Inc; ENVIRO-BARRIER SILICONE: www.h-b.com/#sle.
   4) Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES
A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
   2. Color: Green.
C. Primer: Liquid applied polymer.
   1. Width: 4 inches.
E. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable.
F. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that surfaces and conditions are ready for work of this section.
B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION
A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION
A. Install materials in accordance with manufacturer's installation instructions.
B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
D. Fluid-Applied Coatings or Membranes:
   1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
   2. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
E. Openings and Penetrations in Exterior Air Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
3. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
4. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
5. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
6. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
7. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA 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.

3.05 PROTECTION
A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION
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SECTION 07 4213.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.
B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS
A. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.
   3. Fabrication instructions and recommendations.
   4. Specimen warranty for finish, as specified herein.
C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.
   4. Specimen warranty for wall system, as specified herein.
D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips,
exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
1. Indicate panel numbering system.
2. Differentiate between shop and field fabrication.
3. Indicate substrates and adjacent work with which the wall system must be coordinated.
4. Include large-scale details of anchorages and connecting elements.
5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
E. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.
F. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
G. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
H. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
I. Installer's qualification statement.
J. Testing agency's qualification statement.
K. Maintenance Data: Care of finishes and warranty requirements.

1.05 QUALITY ASSURANCE
A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
C. Manufacturer Qualifications: Company specializing in manufacturing wall panel systems specified in this section.
D. Installer Qualifications: Company specializing in performing work of type specified in this section.
E. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy-duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.
B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.
1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2  PRODUCTS

2.01 MANUFACTURERS
A. Metal Composite Material (MCM) Sheet Manufacturers:
   1. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS: www.alucobondusa.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALL PANEL SYSTEM
A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing
   or other substrate provided by others; provide installed panel system capable of maintaining
   specified performance without defects, damage, or failure.
   1. Provide structural design by or under direct supervision of a Structural Engineer licensed
      in the State in which the Project is located.
   2. Provide panel jointing and weatherseal using a "wet", sealant-sealed system.
   3. Anchor panels to supporting framing without exposed fasteners.

2.03 PERFORMANCE REQUIREMENTS
A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement
   due to expansion and contraction under material temperature range of minus 20 degrees F to
   180 degrees F without buckling, opening of joints, undue stress on fasteners, or other
detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection
   procedures.
B. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without
   permanent deformation or failures of structural members under the following conditions:
   1. Design Wind Pressure: In accordance with local building code.
   2. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall;
      maximum deflection of individual panels of L/60.
   3. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing
      members to anchors.
C. Air Leakage: 0.10 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in
   accordance with ASTM E283/E283M.
D. Water Penetration: No water penetration under static pressure when tested in accordance with
   ASTM E331 at a differential of 10 percent of inward acting design load, 6.27 psf minimum, after
   15 minutes.
   1. Water penetration is defined as the appearance of uncontrolled water on the interior face
      of the wall.
   2. Design to drain leakage and condensation to the exterior face of the wall.

2.04 MATERIALS
A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of
   extruded thermoplastic material; no foamed insulation material content.
   1. Overall Sheet Thickness: 0.118 inch, minimum.
   2. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin
      nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in
      bond performance, when tested in accordance with ASTM D1781, simulating resistance to
      panel delamination, after 8 hours of submersion in boiling water and after 21 days of
      immersion in water at 70 degrees F.
3. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
4. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.

B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
   1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.

2.05 FINISHES
A. Factory Finish: Two coat fluoropolymer resin coating, approved by coating manufacturer for length of warranty specified for project, and applied by coil manufacturing facility that specializes in coil applied finishes.
   1. Coating Flexibility: Pass ASTM D4145 minimum 1T Bend at time of manufacturing.
   2. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
B. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.
C. Color/Texture: As selected by Architect from manufacturer's full range.

2.06 ACCESSORIES

PART 3 EXECUTION
3.01 EXAMINATION
A. Examine dimensions, tolerances, and interfaces with other work.
B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION
A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION
A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
G. Where joints are designed for field-applied sealant, seal joints completely with specified sealant.
H. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

J. Replace damaged products.
   1. Exception: Field repairs of minor damage to finishes are permitted.
   2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements for additional requirements.
   B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
   C. Site Visits: Schedule two site visits during execution of installation.

3.05 CLEANING
   A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
   B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
   C. Remove temporary coverings and protection of adjacent work areas.
   D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION
   A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION
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SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1  GENERAL
1.01  SECTION INCLUDES
A. Adhered system with thermoplastic roofing membrane.
B. Insulation, flat and tapered.
C. Flashings.

1.02  REFERENCE STANDARDS

1.03  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.
C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
D. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

1.04  QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience.

1.05  DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
B. Store materials in weather protected environment, clear of ground and moisture.
C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
D. Protect foam insulation from direct exposure to sunlight.

1.06  FIELD CONDITIONS
A. Do not apply roofing membrane during unsuitable weather.
B. Follow manufacturer's guidelines for applying roofing membrane when ambient temperature is below 40 degrees F.
C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Same manufacturer as membrane material.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING - UNBALLASTED APPLICATIONS
A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over vapor retarder and insulation.
B. Roofing Assembly Requirements:
   1. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
   2. Design Wind Loads: Comply with ANSI/SPRI WD-1 for Category II, Exposure C, and with requirements of applicable code.
C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
   1. Minimum 2 layers of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
D. Acceptable Insulation Types - Tapered Application: Any of types specified.
   1. Tapered polyisocyanurate, perlite, or extruded polystyrene board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS
A. Membrane Roofing Materials:
   a. Thickness: 45 mil, 0.045 inch, minimum.
   b. Sheet Width:
B. Seaming Materials: As recommended by membrane manufacturer.
C. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION
A. Cellulose Fiber Board Insulation: ASTM C208 Type II; natural finish.
B. Perlite Board Insulation: Expanded perlite mineral aggregate, complying with ASTM C728.
   1. Board Size: 24 by 48 inches.
   2. Board Thickness: 1/2 inch.
C. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578, with drainage channels on one face.
   1. Board Size: 48 by 96 inches.
D. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 2, 20 psi (138 kPa), minimum.
3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F.

2. Board Size: 48 by 96 inches.
3. Board Thickness: 1.5 inches.
4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
6. Thermal Resistance: R-value as indicated on drawings.

E. Mineral Wool Board Insulation: Rigid mineral wool fiber complying with ASTM C726; top surface coated with asphalt and Kraft paper.
   2. Board Thickness: 1 inch.

F. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578, with natural skin surface and drainage channels on one face.
   2. Board Thickness: 1-1/2 inches.
   3. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   5. Type and Thermal Resistance, R-value (RSI-value): Type VI, 5.0 (0.88) per 1 inch at 75 degrees F mean temperature using ASTM C177 test method.
   6. Type and Compressive Resistance: Type XII, 15 psi (104 kPa), minimum.
   7. Type and Board Density: Type XII, 1.20 lb per cu ft (19 kg/cu m), minimum.

   1. Integral Protection Boards: Manufacturer's standard.

2.05 ACCESSORIES
A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
C. Membrane Adhesive: As recommended by membrane manufacturer.
D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
F. Insulation Adhesive: As recommended by insulation manufacturer.
G. Sealants: As recommended by membrane manufacturer.
H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   2. Size: 30 by 30 inches.

PART 3 EXECUTION
3.01 INSTALLATION, GENERAL
A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
B. Do not apply roofing membrane during cold or wet weather conditions.
C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE
A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
B. Lay subsequent layers of insulation with joints staggered from those of preceding layer below a minimum of 25% of the overall dimension of the board.
C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
G. Do not install more insulation than can be covered with membrane in same day.

3.03 INSTALLATION - MEMBRANE
A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
B. Shingle joints on sloped substrate in direction of drainage.
C. Fully Adhered Application: Apply adhesive to substrate at rate of 1.6 to 2.2 gallons per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.
F. Around roof penetrations, seal flanges and flashings with flexible flashing.
G. Coordinate installation of roof drains and sumps and related flashings.

END OF SECTION
SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, exterior penetrations, and other items indicated in Schedule.
   B. Sealants for joints within sheet metal fabrications.

1.02  REFERENCE STANDARDS
   B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.

1.03  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   C. Samples: Submit two samples 6 by 6 inch in size illustrating metal finish color.

1.04  QUALITY ASSURANCE
   A. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.05  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. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
   B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   C. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with silicone modified polyester coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.

2.02  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; 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 long legs; seam for rigidity, seal with sealant.
F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 ACCESSORIES
A. Fasteners: Galvanized steel, with soft neoprene washers.
C. Primer Type: Zinc chromate.
D. Concealed Sealants: Non-curing butyl sealant.
E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
G. Reglets: Surface mounted type, galvanized steel with factory applied colored finish.

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, 0.015 inch.

3.03 INSTALLATION
B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
C. Apply plastic cement compound between metal flashings and felt flashings.
D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
E. Seal metal joints watertight.
F. Slope gutters 1/4 inch per 10 feet, minimum.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION
SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS
A. Divisions 21, 22 and 23: Firestopping of mechanical work.
B. Divisions 25, 26, 27 and 28: Firestopping of electrical work.

1.03 REFERENCE STANDARDS
H. ITS (DIR) - Directory of Listed Products; Current Edition.
J. FM (AG) - FM Approval Guide; Current Edition.
M. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. Coordinate construction of openings, penetrations and construction joints to ensure that the firestop systems are installed according to specified requirements.
2. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through penetration of firestop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
3. Coordinate firestopping with other trades so that obstructions are not placed in the way prior to the installation of the firestop systems.
4. Do not cover up through penetration firestop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

B. Identification and Documentation:
1. The firestop contractor shall supply documentation for each single application addressed. This documentation shall identify each penetration and joint location on the entire project.
2. The Documentation form for through penetrations shall include:
a. A sequential location number.
b. Detailed description of the penetration's location.
c. Tested system or engineered judgment number.
d. Type of assembly penetrated.
e. A detailed description of the size and type of penetrating item.
f. Size of opening.
g. Number of sides of assemblies addressed.
h. Hourly rating to be achieved.

3. The Documentation form for construction joints shall include:
   a. A sequential location number.
   b. Detailed description of the construction joint's location.
   c. Tested system or engineered judgment number.
   d. Type of construction joint.
   e. The width of the joint.
   f. Number of sides addressed.
   g. Hourly rating to be achieved.

4. Identify through penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   a. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage".
   b. Contractor's name, address, and phone number.
   c. Through penetration firestop system designation of applicable testing and inspecting agency.
   d. Through penetration firestop system manufacturer's name.

1.05 SUBMITTALS
   A. See Section 01 3000 - 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. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
   E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   F. Installer's qualification statement.

1.06 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.
      2. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
      3. For firestop applications that exists for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.
   B. Installer Qualifications: Company specializing in performing the work of this section and:
      1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
2. Installation Responsibility: Assign installation of through penetration firestop systems and fire-resistive joint systems in project to a single sole source firestop specialty contractor.

3. The work is to be installed by a contractor with at least one of the following qualifications:
   a. FM 4991 Approved Contractor.
   b. UL Approved Contractor.
   c. Hilti Accredited Fire Stop Specialty Contractor.

4. Verification of at least five satisfactorily completed projects of comparable size and type.

5. Licensed by local authorities having jurisdiction (AHJ).

1.07 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. Provide firestopping materials and devices used in any individual system from the same manufacturer; no exceptions.

2.02 MATERIALS
   A. Firestopping Materials: Any materials meeting requirements.
   B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
   C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
   D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 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 (HW) 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 wall assembly.
   C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) 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. Perimeter Wall-to-Floor Joints, Where Both, Either, or Neither Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   E. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 or UL 1479 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 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.
   B. Firestopping Between Edge of Floor Slab and Curtain Wall without Penetrations: Fiber firestopping with smoke seal coating; UL (FRD) Design No. indicated on drawings, T Rating 3/4 hour.
C. Firestopping Between Edge of Floor Slab and Exterior Wall (without Penetrations): Fiber firestopping with smoke seal coating; UL Design No. as indicated on drawings.

D. Firestopping Between Top of Partition Wall and Roof Slab: Fiber firestopping with smoke seal coating; UL (FRD) Design No. as indicated on drawings, F Rating as indicated on drawings hour, provide at locations as indicated on drawings.

2.05 MATERIALS

A. Elastomeric Latex Firestopping: Single component latex elastomeric compound and compatible latex sealant; conforming to the following:
   1. Conform to the requirements of ASTM C920 for Elastomeric joint sealants, Type S, Grade NS, class 25, use NT, G, A and M.
   2. Manufacturers:
      b. 3M Fire Protection Products; Fire Dam 150+: www.3m.com/firestop.
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Conform to the requirements of ASTM C920 for Elastomeric joint sealants, Type S, Grade NS, class 25, use NT, G, A and M.
   2. Manufacturers:
      b. 3M Fire Protection Products; Fire Barrier 2000+: www.3m.com/firestop.
      e. Substitutions: See Section 01 6000 - Product Requirements.

C. Foam Firestopping: Multiple component silicone foam compound; conforming to the following:
   1. Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
   2. Manufacturers:
      a. 3M Fire Protection Products; Fire Barrier 2001 Silicone RTV Foam: www.3m.com/firestop.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Firestop Devices - Wrap, Cable Management, or Preformed Joint Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
   1. Durability and Longevity: Permanent; suitable for pedestrian traffic.
   2. Manufacturers:
      b. 3M Fire Protection Products; ULTRA-PPD: www.3m.com/firestop.
e. Rectorseal; Metacaulk Pipe Collar: www.rectorseal.com.
f. Substitutions: See Section 01 6000 - Product Requirements.

F. Firestop Devices - Cast-In Type: Sleeve and sealing material, intended to be cast in concrete floor forms or in concrete on metal deck, not requiring any additional materials to achieve penetration seal.
   1. Durability and Longevity: Permanent.
   2. Manufacturers:
      b. Substitutions: See Section 01 6000 - Product Requirements.

G. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Manufacturers:
      a. 3M Fire Protection Products; Fire Barrier Moldable Putty: www.3m.com/firestop.
      d. Substitutions: See Section 01 6000 - Product Requirements.

H. Reusable Firestopping: Removable intumescent compressible shapes, pillows, or blocks specifically tested in removable configuration; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Manufacturers:
      b. RectorSeal; FlameSafe Bags or Pillows: www.rectorseal.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

I. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify 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 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.

3.03 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.

3.04 CLEANING
   A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION
   A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
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SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Nonsag gunnable joint sealants.
B. Self-leveling pourable joint sealants.
C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS
A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
F. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
   4. Allow sufficient time for testing to avoid delaying the work.
   5. Deliver sufficient samples to manufacturer for testing.
   6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Name(s) of sealant manufacturer's field representatives who will be observing.
   3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
      b. Test date.
      c. Location on project.
      d. Sealant used.
      e. Stated movement capability of sealant.
      f. Test method used.
      g. Date of installation of field sample to be tested.
      h. Date of test.
      i. Copy of test method documents.
      j. Age of sealant upon date of testing.
      k. Test results, modeled after the sample form in the test method document.
      l. Indicate use of photographic record of test.

E. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

F. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:

B. Self-Leveling Sealants:

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between doors, windows, and other frames or adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items:
      a. Joints between door frames and window frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
         1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
      c. Other joints indicated below.
   3. Do not seal the following types of joints:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with manufactured expansion joint cover assemblies or other sealing devices.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.

B. Type 1 - Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
   1. Type 17 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
2. Type 17 - Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
3. Type 17 - Bedding window frames and door thresholds: Butyl rubber, non-curing.
4. Type 14 - Joints between door and window frames and wall surfaces in Non-Wet Areas: Acrylic emulsion latex sealant.
5. Type 8 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: Match adjacent finished surfaces, unless otherwise indicated for specific sealant type.

2.04 NONSAG JOINT SEALANTS

A. Type 1 - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   5. Cure Type: Single-component, neutral moisture curing.
   6. Service Temperature Range: Minus 20 to 180 degrees F.
   7. Products:
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Type 10 - Epoxy Sealant: ASTM C920, Type I and III, Grade 3, Class B and C; two-component.
   1. Color: Match adjacent finished surfaces.
   2. Service Temperature Range: 40 to 120 degrees F.
   3. Products:
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Type 17 - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
   1. Products:

2.05 SELF-LEVELING JOINT SEALANTS

A. Type 22 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Service Temperature Range: Minus 40 to 180 degrees F.
   4. Products:
      b. Substitutions: See Section 01 6000 - Product Requirements.
B. Type 27 - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
   1. Composition: Multicomponent, 100 percent solids by weight.
   2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
   5. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.
   6. Products:
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES
A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that joints are ready to receive work.
B. Verify that backing materials are compatible with sealants.
C. Verify that backer rods are of the correct size.
D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Arrange for sealant manufacturer's technical representative to be present during tests.
   4. Record each test on Preinstallation Adhesion Test Log as indicated.
   5. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   6. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION
A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION
A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Provide joint sealant installations complying with ASTM C1193.
C. Install acoustical sealant application work in accordance with ASTM C919.
D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
E. Install bond breaker backing tape where backer rod cannot be used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.
E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
F. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION
OPENINGS

DIVISION 08
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SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Non-fire-rated hollow metal doors and frames.
B. Hollow metal frames for wood doors.
C. Fire-rated hollow metal doors and frames.
D. Thermally insulated hollow metal doors with frames.
E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS
A. Section08 1416 - Flush Wood Doors: For wood doors installed in steel frames.
B. Section 08 7100 - Door Hardware.
C. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
D. Section 09 9123 - Interior Painting: Field painting.
E. Section 09 9600 - High-Performance Coatings: Field finishing.

1.03 REFERENCE STANDARDS
B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.
D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
K. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.
M. ITS (DIR) - Directory of Listed Products; Current Edition.
N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
U. UL (DIR) - Online Certifications Directory; Current Edition.
V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination: Coordinate the work with door opening construction, door frame and door hardware installation.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
   C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
   D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
   B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Hollow Metal Doors and Frames:
      1. Ceco Door, an Assa Abloy Group company; Regent interior and Legion exterior doors with S Series frames: www.assaabloydss.com/#sle.
      3. Republic Doors, an Allegion brand; Standard doors with ME Series frames: www.republicdoor.com/#sle.
      4. Steelcraft, an Allegion brand; L Series interior and exterior doors with F Series frames: www.allegion.com/#sle.
      6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS
   A. Requirements for Hollow Metal Doors and Frames:
      1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
      2. Accessibility: Comply with ICC A117.1 and ADA Standards.
      3. Door Edge Profile: Manufacturers standard for application indicated.
      5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
      6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip
process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### 2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 1 - Standard-duty.
   b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.

3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.


C. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 1 - Standard-duty.
   b. Physical Performance Level C, 250,000 cycles; Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 2 - Seamless.
   d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.

2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.


D. Fire-Rated Doors:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 2 - Heavy-duty.
   b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   b. Attach fire rating label to each fire rated unit.
   c. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following:
      1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
3) Label: Include the "S" label on fire-rating label of door.
3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.

2.04 HOLLOW METAL FRAMES
A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
B. Frame Finish: Factory primed and field finished.
C. Exterior Door Frames: Full profile/continuously welded type.
   2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   3. Weatherstripping: Separate, see Section 08 7100.
D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
E. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES
A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 ACCESSORIES
A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
B. Glazing: As specified in Section 08 8000, factory installed.
C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center millions.
F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.
C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION
A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION
A. Install doors and frames in accordance with manufacturer’s instructions and related requirements of specified door and frame standards or custom guidelines indicated.
B. Install fire rated units in accordance with NFPA 80.
C. Coordinate frame anchor placement with wall construction.
D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
E. Install door hardware as specified in Section 08 7100.
F. Comply with glazing installation requirements of Section 08 8000.
G. Coordinate installation of electrical connections to electrical hardware items.
H. Provide silencers in all frames not scheduled to receive weatherstripping, gasketing or other seals.

3.04 TOLERANCES
A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861
B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING
A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE - SEE DRAWINGS
END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS
A. Section 08 7100 - Door Hardware: Mortise cylinder and core hardware.
B. Section 09 9000 - Painting: Field paint finish.
C. Division 23 Section: Access doors in ductwork.

1.03 REFERENCE STANDARDS
A. ITS (DIR) - Directory of Listed Products; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination: Coordinate the work with other work requiring access doors.
   1. Provide access doors at all concealed mechanical and electrical items requiring access.
B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
D. Manufacturer's Installation Instructions: Indicate installation requirements.
E. Project Record Documents: Record actual locations of each access unit.

PART 2 PRODUCTS

2.01 WALL- AND CEILING-MOUNTED ACCESS UNITS
A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.
B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Style: Exposed frame with door surface flush with frame surface.
      a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Heavy-Duty Frames: 14-gauge, 0.0747-inch minimum thickness.
   5. Heavy-Duty Single Steel Sheet Door Panels: 14-gauge, 0.0747-inch minimum thickness.
   6. Double-Skinned Hollow Steel Sheet Door Panels: 16-gauge, 0.059-inch minimum thickness, on both sides and along each edge.
   7. Insulation: Non-combustible mineral wool or glass fiber.
   8. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
   10. Door/Panel Size: As indicated on the drawings.
   11. Hardware:
      a. Hardware for Fire-Rated Units: As required for listing.
b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
c. Latch/Lock: Tamperproof tool-operated cam latch.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that rough openings are correctly sized and located.
   B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION
   A. Clean surfaces thoroughly prior to proceeding with this work.
   B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION
   A. Install units in accordance with manufacturer's instructions.
   B. Install frames plumb and level in openings, and secure units rigidly in place.
   C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION
SECTION 08 3313
COILING COUNTER DOORS

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Rough openings.
B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
C. Section 08 7100 - Door Hardware: Cylinder cores and keys.
D. Section 09 9000 - Painting: Field paint finish.

1.03 REFERENCE STANDARDS
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
D. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.05 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2  PRODUCTS

2.01 MANUFACTURERS
A. Coiling Counter Doors:
   1. Cornell:
      a. Model: ESC10
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS
A. Coiling Counter Metal Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   3. Slat Profile: Flat, perforated.
   5. Guides: Formed track; same material and finish unless otherwise indicated.

2.03 COMPONENTS
A. Metal Curtain Construction: Interlocking, single-thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Lock Hardware:

D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that adjacent construction is suitable for door installation.
B. Verify that electrical services have been installed and are accessible.
C. Verify that door opening is plumb, header is level, and dimensions are correct.
D. Notify Architect of any unacceptable conditions or varying dimensions.
E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION
A. Install units in accordance with manufacturer's instructions.
B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES
A. Maintain dimensional tolerances and alignment with adjacent work.
B. Maximum Variation From Plumb: 1/16 inch.
C. Maximum Variation From Level: 1/16 inch.
D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING
A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING
A. Clean installed components.
B. Remove labels and visible markings.

END OF SECTION
SECTION 08 5413
FIBERGLASS WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Factory fabricated fiberglass windows with fixed and operating sash.
B. Glazed by factory or on-site; including infill panels.
C. Operating hardware.
D. Insect screens.

1.02 RELATED REQUIREMENTS
A. Section 07 2500 - Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.
B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Convene one week week before starting work of this section.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
D. 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.
E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
F. 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 work of the type specified and with at least three years of 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.
B. Maintain this minimum temperature during and after installation of sealants.

1.09 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Correct defective Work within a ten year period after Date of Substantial Completion.
C. Provide ten 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. Fiberglass Windows:

2.02 WINDOW UNITS
A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings.
   4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

2.03 PERFORMANCE REQUIREMENTS
A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Grade (PG): Equivalent to or greater than design wind load.
B. Design Pressure (DP): In accordance with applicable codes.
C. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
D. Thermal:
   1. Thermal Transmittance: Provide assembly tested and labeled in accordance with NFRC 100.

2.04 COMPONENTS
A. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
B. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 GLASS AND GLAZING MATERIALS
A. Glass and Glazing Materials: See Section 08 8000 for Types described below:

2.06 HARDWARE
A. Casement and Awning Sash: Zinc die-cast steel worm-gear operator with Painted finish.
B. Horizontal Sliding Sash: Extruded PVC interfacing tracks, limit stops in head and sill track.
C. Window Opening Control Devices (WOCD): Provide operable window sash hardware that limits openings to only allow passage of 4 inch diameter rigid sphere or less, and are easily releasable to fully open without use of keys, tools, or special knowledge.
D. Finish For Exposed Hardware: Match window finish.

2.07 FABRICATION
A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
B. Factory glaze window units.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION
A. Install windows in accordance with manufacturer's instructions.
B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
D. Set sill members and sill flashing in continuous bead of sealant.
E. 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.
F. Install operating hardware.

3.03 FIELD QUALITY CONTROL
A. Provide services of fiberglass window manufacturer's field representative to observe for proper installation of system and submit report.
B. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
C. Provide field testing of installed fiberglass 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. 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.
   2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf.
D. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.04 ADJUSTING
A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING
A. Remove protective material from pre-finished surfaces.
B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Section “Flush Wood Doors”.
   3. Division 08 Section “Aluminum-FramedEntrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
   1. ANSI/BHMA Certified Product Standards - A156 Series.
   2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
   3. ANSI/UL 294 - Access Control System Units.
   4. UL 305 - Panic Hardware.
   5. ANSI/UL 437- Key Locks.
1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

   3. Content: Include the following information:

      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.
      g. Door and frame sizes and materials.
      h. Warranty information for each product.

   4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

   1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

      a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
      b. Complete (risers, point-to-point) access control system block wiring diagrams.
      c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:
   1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".
1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:
   a. Hager Companies (HA) - BB Series, 5-knuckle.
   b. Ives (IV) - 5BB Series, 5-knuckle.
   d. dormakaba Best (ST) - F/FBB Series, 5-knuckle.

2.2 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:
   a. Pemko (PE) - EL-CEPT Series.
   b. Securitron (SU) - EL-CEPT Series.
   c. Von Duprin (VD) - EPT-10 Series.

B. Provide mortar guard enclosure on steel frames installed at masonry openings for each electrical hinge specified.
2.3 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
3. Manufacturers:
   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TC).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:
   a. dormakaba Best (BE).
   b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):
   1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
   2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
   1. Manufacturers:
      a. dormakaba Best (BE) - 45H Series. Not Approved with Indicator.
      b. Sargent Manufacturing (SA) - 8200 Series. Approved with Indicator.
      c. Schlage (SC) - L9000 Series. Approved with Indicator.
      d. No Substitution.

2.6 AUXILIARY LOCKS

A. Cylindrical Deadlocks: ANSI/BHMA A156.36 Grade 2 Certified Products Directory (CPD) deadbolts to fit standard ANSI 161 preparation in functions and with visual status indicators as specified in the hardware sets.
   1. Manufacturers:
      a. Schlage (SC) – B500 Series.
      b. dormakaba Best (BE) – 83T Series.
      c. Sargent Manufacturing (SA) - 460 Series.
      d. No Substitution.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer’s special strike box fabricated for aluminum framing.
   4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
B. Standards: Comply with the following:

2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Mounted with through-bolts.

1. Manufacturers:
   a. LCN Closers (LC) – 4011 / 4111 Series.
   b. No Substitution.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1” less than door width on pull side. Coordinate and provide proper width
and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:
   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TC).

2.10 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
   b. Rockwood (RO).
   c. Glynn Johnson (GJ).
2.11 ARCHITECTURAL SEALS
A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. National Guard Products (NG).
   2. Pemko (PE).

2.12 ELECTRONIC ACCESSORIES
A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
   1. Manufacturers:
      a. Security Door Controls (SD) - DPS Series.
      b. Securitron (SU) - DPS Series.
2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.


3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.


3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.
C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION
A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS
A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. VD - Von Duprin
3. SC - Schlage
4. BE - BEST Locks
5. RO - Rockwood
6. GJ - Glynn-Johnson
7. LC - LCN Closers
8. PE - Pemko
9. OT - Other
10. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 107, 109, 111, 114, 125, 126

3 Hinge, Full Mortise, Hvy Wt T4B3386 4-1/2" x 4-1/2" US32D MK
1 Deadbolt (classroom) B563 BD US26D SC
1 SFIC Cylinder SFIC Cylinder US26D BE
1 Push Plate 70C 4" x 16" US32D RO
1 Pull Plate BF 110 x 70C 4" x 16" US32D RO
1 Door Closer (reg arm, pull side) 4011 REG ALUM LC
1 Wall Stop 406 US32D RO
1 Threshold 171A PE
1 Door Bottom w/ rain drip 216AV x TKSP8 PE
1 Weatherstripping 303AS x TKSP8 PE

**Set: 2.0**

Doors: 101, 102, 121, 122

3 Hinge, Full Mortise, Hvy Wt T4B3386 4-1/2" x 4-1/2" US32D MK
1 Hinge, Full Mortise, Hvy Wt T4B3386 4-1/2" x 4-1/2" US32D MK
1 Mortise Lock (office - privacy w/ indicator) L9056 06N x L283-722 indicator x L583-363 turn US26D SC
1 Deadbolt (classroom) B563 BD US26D SC
1 SFIC Cylinder SFIC Cylinder US26D BE
1 Cylinder (mortise) 1E-74 US26D BE
1 Door Closer (reg arm, pull side) 4011 REG ALUM LC
1 Wall Stop 406 US32D RO
1 Threshold 171A PE
1 Door Bottom w/ rain drip 216AV x TKSP8 PE
1 Weatherstripping 303AS x TKSP8 PE

**Set: 3.0**

Doors: 105, 117

3 Hinge, Full Mortise, Hvy Wt T4B3786 4-1/2" x 4-1/2" US26D MK
1 Mortise Latch (passage) L9010 06N US26D SC
1 Door Closer (hd arm, push side) 4111 EDA ALUM LC
1 Kick Plate K1050 10" x 2" LDW CSK BEV US32D RO
1 Wall Stop 406 US32D RO

**Set: 4.0**

Doors: 202, 203, 204, 206

3 Hinge, Full Mortise, Hvy Wt T4B3786 4-1/2" x 4-1/2" US26D MK
1 Mortise Lock (classroom) L9070 06N US26D SC
1 Door Closer (reg arm, pull side) 4011 REG ALUM LC
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<th>Specification</th>
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<td>RO</td>
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<td>Gasketing</td>
<td>S88D (head and jambs)</td>
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<tr>
<td>Wall Stop</td>
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<td>US32D</td>
<td>RO</td>
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**Set: 5.0**

Doors: 131

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<td>US26D</td>
<td>MK</td>
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<td>Mortise Lock (classroom)</td>
<td>L9070 06N</td>
<td>US26D</td>
<td>SC</td>
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<td>Cylinder (mortise)</td>
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<td>Door Closer (hd arm, push side)</td>
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<td>Kick Plate</td>
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**Set: 6.0**

Doors: 131.1

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<td>Cylinder (mortise)</td>
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<td>BE</td>
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<td>Door Closer (hd arm w/ stop, push side)</td>
<td>4111 SCUSH</td>
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<td>LC</td>
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<td>Kick Plate</td>
<td>K1050 10&quot; x 2&quot; LDW CSK BEV</td>
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**Set: 7.0**

Doors: 108, 113, 118, 124

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<td>Mortise Lock (storeroom)</td>
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**Set: 8.0**

Doors: 209, 212

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<td>Mortise Lock (storeroom)</td>
<td>L9080 06N</td>
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<tr>
<td>Cylinder (mortise)</td>
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<td>US26D</td>
<td>BE</td>
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<tr>
<td>Door Closer (reg arm, pull side)</td>
<td>4011 REG</td>
<td>ALUM</td>
<td>LC</td>
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<tr>
<td>Kick Plate</td>
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<td>US32D</td>
<td>RO</td>
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<tr>
<td>Gasketing</td>
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<td><strong>1 Wall Stop</strong></td>
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<td><strong>Doors:</strong> 128</td>
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<td>US26D MK</td>
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<td>1 Mortise Lock (storeroom)</td>
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<td>1 Door Closer (reg arm, pull side)</td>
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<td>ALUM LC</td>
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<tr>
<td>1 Threshold</td>
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<td>1 Door Bottom w/ rain drip</td>
<td>216AV x TKSP8</td>
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<td>1 Weatherstripping</td>
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<td>1 Position Switch</td>
<td>DPS-M-BK</td>
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| **Set:** 10.0  |
|----------------|-----|-----------|
| **Doors:** 210.1, 210.2 |
| 3 Hinge, Full Mortise, Hvy Wt | T4B3386 NRP 4-1/2" x 4-1/2" | US32D MK |
| 1 Mortise Lock (storeroom) | L9080 06N | US26D SC |
| 1 Cylinder (mortise) | 1E-74 | US26D BE |
| 1 Door Closer (hd arm w/ stop, push side) | 4111 SCUSH | ALUM LC |
| 1 Threshold | 171A | PE |
| 1 Sweep | 315CN x TKSP8 | PE |
| 1 Weatherstripping | 303AS x TKSP8 | PE |
| 1 Rain Guard | 346A x TKSP8 (door width + 4") | PE |
| 1 Latch Protector | 321 | US32D RO |
| 1 Position Switch | DPS-M-BK | SU |

| **Set:** 11.0  |
|----------------|-----|-----------|
| **Doors:** 104 |
| 3 Hinge, Full Mortise, Hvy Wt | T4B3386 NRP 4-1/2" x 4-1/2" | US32D MK |
| 1 Electric Power Transfer | EPT10 | ALUM VD |
| 1 Electrified Mortise Lock | L9092EU 06N | US26D SC |
| 1 Cylinder (mortise) | 1E-74 | US26D BE |
| 1 Door Closer (hd arm w/ stop, push side) | 4111 SCUSH | ALUM LC |
| 1 Kick Plate | K1050 10" x 2" LDW CSK BEV | US32D RO |
| 1 Threshold | 171A | PE |
| 1 Sweep | 315CN x TKSP8 | PE |
1 Weatherstripping 303AS x TKSP8 PE
1 Rain Guard 346A x TKSP8 (door width + 4”) PE
1 Latch Protector 321 US32D RO
1 Card Reader Card Reader by Security Contractor OT
1 Lift Door System Relay Controls by Lift Door System OT
1 Position Switch DPS-M-BK SU
1 Power Supply Power Supply by Security Contractor OT

Set: 12.0

Doors: 208

3 Hinge, Full Mortise, Hvy Wt T4B3786 NRP 4-1/2" x 4-1/2" US26D MK
1 Mortise Lock (storeroom) L9080 06N US26D SC
1 Cylinder (mortise) 1E-74 US26D BE
1 Door Closer (hd arm w/ stop, push side) 4111 SCUSH ALUM LC
1 Kick Plate K1050 10" x 2" LDW CSK BEV US32D RO
1 Gasketing S88D (head amd jambs) PE
1 Lift Door System Relay Controls by Lift Door System OT
1 Position Switch DPS-M-BK SU

Set: 13.0

Doors: 103, 106, 116, 129

3 Hinge, Full Mortise, Hvy Wt T4B3786 4-1/2” x 4-1/2” US26D MK
1 Electric Power Transfer EPT10 ALUM VD
1 Electrified Mortise Lock L9092EU 06N US26D SC
1 Cylinder (mortise) 1E-74 US26D BE
1 Door Closer (reg arm, pull side) 4011 REG ALUM LC
1 Wall Stop 406 US32D RO
1 Threshold 171A PE
1 Door Bottom w/ rain drip 216AV x TKSP8 PE
1 Weatherstripping 303AS x TKSP8 PE
1 Card Reader Card Reader by Security Contractor OT
1 Position Switch DPS-M-BK SU
1 Power Supply Power Supply by Security Contractor OT

Set: 14.0

Doors: 130

3 Hinge, Full Mortise, Hvy Wt T4B3786 4-1/2” x 4-1/2” US26D MK

DOOR HARDWARE 087100 - 18
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<td>1 Overhead Stop (concealed)</td>
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<tr>
<td>1 Card Reader</td>
<td>Card Reader by Security Contractor</td>
<td></td>
<td>OT</td>
<td></td>
</tr>
<tr>
<td>1 Position Switch</td>
<td>DPS-M-BK</td>
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<td>SU</td>
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<tr>
<td>1 Power Supply</td>
<td>Power Supply by Security Contractor</td>
<td></td>
<td>OT</td>
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**Set: 15.0**

Doors: 120, 211.1, 211.2

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<th>Quantity</th>
<th>Model/Part Number</th>
<th>Finish/Code</th>
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<tbody>
<tr>
<td>3 Hinge, Full Mortise, Hvy Wt</td>
<td>T4B3386 NRP 4-1/2&quot; x 4-1/2&quot;</td>
<td></td>
<td>US32D MK</td>
<td></td>
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<tr>
<td>1 Electric Power Transfer</td>
<td>EPT10</td>
<td></td>
<td>ALUM VD</td>
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<tr>
<td>1 Electrified Mortise Lock</td>
<td>L9092EU 06N</td>
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<td>US26D SC</td>
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<tr>
<td>1 Cylinder (mortise)</td>
<td>1E-74</td>
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<td>US26D BE</td>
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<tr>
<td>1 Door Closer (hd arm w/ stop, push side)</td>
<td>4111 SCUSH</td>
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<td>ALUM LC</td>
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<tr>
<td>1 Kick Plate</td>
<td>K1050 10&quot; x 2&quot; LDW CSK BEV</td>
<td></td>
<td>US32D RO</td>
<td></td>
</tr>
<tr>
<td>1 Threshold</td>
<td>171A</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>1 Sweep</td>
<td>315CN x TKSP8</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>1 Weatherstripping</td>
<td>303AS x TKSP8</td>
<td></td>
<td>PE</td>
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<tr>
<td>1 Rain Guard</td>
<td>346A x TKSP8 (door width + 4&quot;)</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>1 Latch Protector</td>
<td>321</td>
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<td>US32D RO</td>
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<td>1 Card Reader</td>
<td>Card Reader by Security Contractor</td>
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<td>OT</td>
<td></td>
</tr>
<tr>
<td>1 Position Switch</td>
<td>DPS-M-BK</td>
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<tr>
<td>1 Power Supply</td>
<td>Power Supply by Security Contractor</td>
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**Set: 16.0**

Doors: 201, 207

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<th>Model/Part Number</th>
<th>Finish/Code</th>
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<tr>
<td>3 Hinge, Full Mortise, Hvy Wt</td>
<td>T4B3786 4-1/2&quot; x 4-1/2&quot;</td>
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<td>US26D MK</td>
<td></td>
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<tr>
<td>1 Mortise Lock (classroom)</td>
<td>L9070 06N</td>
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<td>US26D SC</td>
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<tr>
<td>1 Door Closer (reg arm, pull side)</td>
<td>4011 REG</td>
<td></td>
<td>ALUM LC</td>
<td></td>
</tr>
<tr>
<td>1 Kick Plate</td>
<td>K1050 10&quot; x 2&quot; LDW CSK BEV</td>
<td></td>
<td>US32D RO</td>
<td></td>
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<tr>
<td>1 Gasketing</td>
<td>S88D (head amd jambs)</td>
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<td>PE</td>
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<tr>
<td>1 Wall Stop</td>
<td>406</td>
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<td>US32D RO</td>
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</tr>
<tr>
<td>1 Threshold</td>
<td>171A</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>Specification</td>
<td>Location</td>
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<tr>
<td>------------------</td>
<td>--------------------------------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door Bottom</td>
<td>2343AV</td>
<td>PE</td>
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<td></td>
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<tr>
<td>Sound Seal</td>
<td>312CR x TKSP8 (head and jambs)</td>
<td>PE</td>
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</tbody>
</table>

END OF SECTION 087100
SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Insulating glass units.
B. Glazing units.
C. Mirrors.
D. Glazing compounds.

1.02 RELATED REQUIREMENTS
A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
C. Section 08 5413 - Fiberglass Windows: Glazing provided by window manufacturer.
D. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS
M. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.
N. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 DEFINITIONS
A. Sealed Insulating Glass Unit Surfaces:
   1. Surface 1 - Exterior surface of outer pane.
   2. Surface 2 - Interior surface of outer pane.
   3. Surface 3 - Interior surface of inner pane.
   4. Surface 4 - Exterior surface of inner pane.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass and plastic units, showing coloration and design.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), IGMA TM-3000, and ______ for glazing installation methods. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Warranty covers specific items identified below due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

C. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:

B. Float Glass Manufacturers:

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   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. Glass thicknesses listed are minimum.

B. Weather-Resistant Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistant barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
2. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2.03 GLASS MATERIALS
A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
      a. Fabrication by horizontal roller heating process only, roll wave distortion parallel to bottom edge of glass as installed. The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003 inches in the center of a lite and shall not exceed 0.008 inches within 10.5 inches of the leading or trailing edge.
      b. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
      c. For clear or low-iron glass greater than or equal to 5mm thick without ceramic frit or ink, maximum + or - 125 mD (millidiopter) over 95% of the glass surface.
      d. All glass must be heat treated prior to the application of a low-e coating.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Thicknesses indicated are minimums; for exterior glazing comply with specified requirements for wind load design regardless of thickness indicated, provide greater thickness as required for exterior glazing wind load design; for interior glazing limit glass deflection to maximum allowed by applicable code for interior glazed areas regardless of thickness indicated. All glass units glazed within a single frame glazing pocket shall be the same thickness.

2.04 INSULATING GLASS UNITS
A. Manufacturers:
   3. GCI Industries.
   7. Substitutions: See Section 01 6000 - Product Requirements.
B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Warm-Edge Spacers: Thermally broken polyurethane polymer and organic coated aluminum warm-edge technology design.
      a. Spacer Width: As required for specified insulating glass unit.
      b. Spacer Height: Manufacturer's standard.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.
C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   5. Total Thickness: 1 inch.
   6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, nominal.
   8. Solar Heat Gain Coefficient (SHGC): 0.22, maximum.
D. Type IG-5 - Insulating Glass Units: Safety glazing.
   1. Applications:
      a. Glazed sidelights and panels next to doors.
      b. Other locations required by applicable federal, state, and local codes and regulations.
      c. Other locations indicated on drawings.
   2. Space between lites filled with air.
   3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
   4. Total Thickness: 1 inch.

2.05 GLAZING UNITS
A. Type FG-2 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.
   5. Glazing Method: Gasket glazing or any interior method specified.
B. Type FG-5 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      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 drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.
   5. Glazing Method: Gasket glazing or any interior method specified.

2.06 GLAZING COMPOUNDS
A. Type GC-1 - Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.
B. Manufacturers:
6. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES
A. Setting Blocks: Neoprene, EPDM, TPE (Santoprene) or Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
B. Spacer Shims: Neoprene or Silicone, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
C. Glazing Tape: Provide preformed butyl compound or Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, to effect an air barrier and vapor retarder seal.
D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION
3.01 VERIFICATION OF CONDITIONS
A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION
A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL
A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)
A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)
A. Application - Interior Glazed: Set glazing infills from the interior of the building.
B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
E. Place glazing tape on free perimeter of glazing in same manner described above.
F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
G. Carefully trim protruding tape with knife.

3.06 FIELD QUALITY CONTROL
A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING
A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
B. Remove nonpermanent labels immediately after glazing installation is complete.
C. Clean glass and adjacent surfaces after sealants are fully cured.
D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 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.
B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION
SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS
A. Section 07 6200 - Sheet Metal Flashing and Trim.
B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
C. Section 08 4313 - Aluminum-Framed Storefronts: Prepared openings for louvers.
D. Section 23 0913 - Instrumentation and Control Devices for HVAC: Actuators for operable louvers.
E. Section 23 0923 - Direct-Digital Control System for HVAC: Actuators for operable louvers.
F. Section 23 0943 - Pneumatic Control System for HVAC: Actuators for operable louvers.
G. Section 23 3100 - HVAC Ducts and Casings: Ductwork attachment to louvers.
H. Section 23 3300 - Air Duct Accessories: Fire/smoke dampers associated with exterior wall louvers.

1.03 REFERENCE STANDARDS
B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012 (Reapproved 2015).

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
E. Delegated Design Documents: Drawings and calculations sealed by Structural Engineer.
F. Design Data: Provide structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
   1. Calculations must bear the seal of the registered Professional Structural Engineer.
G. Test Reports: Independent agency reports showing compliance with specified performance criteria.
H. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE
A. Designer Qualifications: Design curtain wall and its structural support framing components 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. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.
PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Louvers:
      1. Industrial Louvers, Inc: www.industriallouvers.com/sle.
      2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS
   A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
      1. Design Wind Loads: Comply with the requirements of applicable code.
      2. See structural drawings for design loads.
      3. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
      4. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
      5. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

2.03 MATERIALS

2.04 FINISHES
   A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
   B. Primer: Zinc chromate, alkyd type.
   C. Color: Match storefront/window wall framing.

2.05 ACCESSORIES
   A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
   B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
   C. Insect Screen: 18 x 16 size aluminum mesh.
   D. Fasteners and Anchors: Stainless steel.
   E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
   F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
   B. Verify that field measurements are as indicated.

3.02 INSTALLATION
   A. Install louver assembly in accordance with manufacturer's instructions.
   B. Coordinate with installation of flashings by others.
   C. Install louver level and plumb.
   D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
   E. Secure louver frames in openings with concealed fasteners.
   F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING
   A. Strip protective finish coverings.
B. Clean surfaces and components.

END OF SECTION
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FINISHES
PART 1 GENERAL
1.01 SECTION INCLUDES
   A. the manufacturer, finish and other characteristics of materials specified in other sections, including Interior paint, stain, and high performance coating.
   B. Interior finish materials.
1.02 RELATED REQUIREMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this Section.
1.03 DESIGN REQUIREMENTS
   A. Color and sheen are of prime importance for all aspects of this project. For items not specifically noted herein, contact the Architect.
1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. See individual specification sections for additional requirements.
1.05 QUALITY ASSURANCE
   A. See individual specification sections for additional requirements.
   B. Remove and replace all defective material, damaged material and material damaged in the removal process.

PART 2 PRODUCTS
2.01 LIST OF FINISHES
   A. Project Number - Project Name: 14013 - BHS Stadium Improvements
   B. See 09 0600 Color Schedule, Sheet A2.11, in Construction Drawings.

PART 3 EXECUTION
3.01 INSTALLATION, CLEANING, AND PROTECTION
   A. See individual specification sections for requirements.
3.02 SCHEDULES
   A. See Room Finish and Door Schedule on the Drawings.

END OF SECTION
SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Metal stud wall framing.
   B. Metal channel ceiling framing.
   C. Cementitious backing board.
   D. Gypsum wallboard.
   E. Joint treatment and accessories.

1.02  RELATED REQUIREMENTS
   A. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

1.03  REFERENCE STANDARDS
   J. GA-234 - Control Joints For Fire-Resistance Rated Systems; Gypsum Association; Gypsum Association; 2016.

1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Shop Drawings: Indicate special details associated with fireproofing, control joint layout, acoustic seals, control joint layout, and control joint layout.
   C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.05  QUALITY ASSURANCE
   A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum three years of experience.

PART 2  PRODUCTS
2.01  GYPSUM BOARD ASSEMBLIES
   A. Provide completed assemblies complying with ASTM C840 and GA-216.
      1. See PART 3 for finishing requirements.

2.02  METAL FRAMING MATERIALS
   A. Manufacturers - Metal Framing, Connectors, and Accessories:
      4. Substitutions: See Section 01 6000 - Product Requirements.
   B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
1. Runners: U shaped, sized to match studs.
2. Ceiling Channels: C-shaped.
3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

C. Loadbearing Studs for Application of Gypsum Board: As indicated on the drawings.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

1. See the Gypsum Association’s Fire Resistance Design Manual (GA-600) Figure 8 Perimeter Relief Details for steel stud partition.

E. Non-structural Framing Accessories:

1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.03 BOARD MATERIALS

A. 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. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Use glass-mat-faced gypsum panels, unfaced fiber-reinforced gypsum panels, or mold resistant paper faced gypsum panels.
   b. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
   c. Mold resistant board is required at exterior walls, plumbing walls in toilets, and other wet locations.

3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

4. Thickness:

5. Paper-Faced Products:
   c. USG Corporation; Sheetrock Brand Gypsum Panels.
   d. Substitutions: See Section 01 6000 - Product Requirements.

6. Mold Resistant Paper Faced Products:
   b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
   c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

A. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.

1. Types: As detailed or required for finished appearance.

2. Products:
   a. Same manufacturer as framing materials.
   b. Substitutions: See Section 01 6000 - Product Requirements.


4. Edge Trim: ASTM C1047; LC bead, as defined in ASTM C 840.

5. Expansion (Control) Joint: ASTM C1047; One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Joint Compound: Drying type, vinyl-based, ready-mixed.

C. 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 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
   1. Orientation: Horizontal.
   2. Spacing: As indicated.

E. Blocking: Install wood blocking or mechanically fastened sheet steel strapping for support of:
   1. Other items indicated.

F. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place continuous bead at perimeter of each layer of gypsum board.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.03 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 Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer parallel to framing or furring members. Offset joints of second layer from joints of first layer.

D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Control Joints shall be either manufactured devices designed for this purpose or field fabricated from suitable materials.
   2. Locate control joints according to the criteria listed below and as shown on the drawings.
   3. Control joints in the gypsum board shall be provided where any of the conditions described below exist:
      a. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the building structure.
      b. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.
      c. Not more than 30 feet apart on walls running in an uninterrupted straight plane over 30 feet long.
      d. At interior ceilings with perimeter relief, not more than 50 feet apart in both directions.
      e. At interior ceilings without perimeter relief, not more than 30 feet apart in both directions.
f. At gypsum board partitions above all door frames which are not full height, at the corners on both sides of the wall. Control joints at one or both corners may be omitted if the door frame corner is located at the intersection of partitions.
g. Full height door frames shall be considered equivalent to a control joint.
h. At locations specified by the architect or designer where a control joint is incorporated as a design accent or architectural feature.
i. Where a control joint occurs in an acoustical or fire-rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8” type X gypsum board, mineral fiber or other tested equivalent. See the Gypsum Association’s Fire Resistance Design Manual (GA-600) or Special Recommendations: Control Joints for Fire-Resistance Rated Systems (GA-234).

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.05 JOINT TREATMENT
A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
B. Finish gypsum board in accordance with levels defined in ASTM C840 and GA-214 as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, walls "washed" by light fixtures or natural light and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated as level 5.
   3. Level 0: Temporary partitions.
C. 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.
D. Where level 5 finish is indicated or at glass mat faced gypsum board indicated to receive a level 4 or 5 finish, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.06 TOLERANCES
A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION
SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Resilient base.
   B. Resilient stair accessories.
   C. Installation accessories.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
   B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
   C. Section 09 0600 - Color Schedule: Resilient Flooring and Base manufacturer, style, color and size.

1.03 REFERENCE STANDARDS
   B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
   D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
   C. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.
   D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
   E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 FIELD CONDITIONS
   A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS
2.01 STAIR COVERING
   A. Stair Nosings - Type RSA: 1 13/32 inch horizontal return, 13/16 inch vertical return, full width of stair tread in one piece.
      1. Material: Rubber.
      2. Color & Style: See Section 09 0600 - Color Schedule.

2.02 RESILIENT BASE
   A. Resilient Base - Type RB: ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
      1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
2. Thickness: 0.125 inch.
4. Length: Roll.

2.03 ACCESSORIES
A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
B. Moldings, Transition and Edge Strips: See Section 09 0600 - Color Schedule.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
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 resilient base.
C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      b. Internal Relative Humidity: ASTM F2170.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION
A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
B. Prohibit traffic until filler is fully cured.

3.03 INSTALLATION - GENERAL
A. Starting installation constitutes acceptance of subfloor conditions.
B. Install in accordance with manufacturer's written instructions.
C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.
D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - RESILIENT BASE
A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
B. Install base on solid backing. Bond tightly to wall and floor surfaces.
C. Scribe and fit to door frames and other interruptions.

3.05 INSTALLATION - STAIR COVERINGS
A. Install stair coverings in one piece for full width and depth of tread.
B. Adhere over entire surface. Fit accurately and securely.

3.06 CLEANING
A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean in accordance with manufacturer's written instructions.
3.07 PROTECTION
   A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION
PART 1  GENERAL
1.01  SECTION INCLUDES
  A. Carpet tile, fully adhered.

1.02  RELATED REQUIREMENTS
  A. Section 09 0600 - Color Schedule: Carpet manufacturer, style, color and size.

1.03  REFERENCE STANDARDS
  A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor
     Covering Materials; 2016 (Reapproved 2021).
     a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).
  D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using

1.04  SUBMITTALS
  A. See Section 01 3000 - 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. Accessory Samples: Submit two 12 inch long samples of edge strip, base cap, and stair
     nosing.
  F. Manufacturer's Installation Instructions: Indicate special procedures.
  G. Operation and 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 6000 - Product Requirements, for additional provisions.
     2. Extra Carpet Tiles: Quantity equal to 10 to 15 percent of total installed of each color and
        pattern installed, or nearest full carton.

1.05  QUALITY ASSURANCE
  A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years
     documented experience.

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. See Section 09 0600 - Color Schedule.
  B. Other Acceptable Tile Carpeting Manufacturers:
     1. Substitutions: See Section 01 6000 - Product Requirements.

2.02  MATERIALS
  A. Tile Carpeting Type CPT: Tufted, manufactured in one color dye lot.
     3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with
        ASTM E648 or NFPA 253.
     4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
     5. Smoke Density: < (less than) 450
     6. Light Fastness: >4.0 at 80 hours.
7. Traffic Classification (TARR): Heavy - Severre
B. Carpet Tile Type WMT: Walk-off mat, manufactured in one color dye lot.
   3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with
      ASTM E648 or NFPA 253.
   4. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

2.03 ACCESSORIES
A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
B. Edge Strips: Type TRS, See Section 09 0600 for color.
C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP)
      certified; in lieu of labeled product, independent test report showing compliance is
      acceptable.

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 subfloor surfaces are dust-free and free of substances that could impair bonding of
   adhesive materials to subfloor surfaces.
C. 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 and CRI 104 (Commercial).
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.

3.04 CLEANING
A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION
PART 1  GENERAL
1.01  SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

B. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, cables and labels unless noted otherwise.

E. Prefinished items include the following factory-finished components:
   1. Wood doors.
   2. Toilet enclosures.
   3. Metal lockers.
   4. Elevator entrance doors and frames.
   5. Elevator equipment.
   6. Finished mechanical and electrical equipment and accessories including cabinet unit heaters.
   7. Electrical and Data cables.
   8. Light fixtures.
   9. Switchgear and distribution cabinets
   10. Manufactured Casework.
   11. Fire Extinguisher Cabinets (F.E.C.)

F. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   1. Ceiling plenums.
   2. Foundation spaces and furred areas.
   4. Pipe spaces.
   5. Duct shafts.
   6. Elevator shafts.

G. Finished metal surfaces include the following:
   1. Anodized aluminum.
   2. Stainless steel.
   3. Chromium plate.
   4. Copper and copper alloys.
   5. Bronze and brass and similar finished materials will not require finish painting, unless otherwise indicated.

NOTE: FINISH OF HANDRAILS BOTH EXTERIOR AND INTERIOR SHALL BE DISCUSSED WITH SCHOOLHOUSE PLANNING PRIOR TO ANY FINISHED BEING SPECIFIED AND/OR APPROVED.

H. Operating parts include moving parts of operating equipment and the following:
   1. Valve and damper operators.
   2. Linkages.
   4. Motor and fan shafts.
I. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED REQUIREMENTS
   A. Section 09 0600 - Color Schedule: Paint manufacturer and colors.
   B. Section 09 9600 - High-Performance Coatings.

1.03 DEFINITIONS
   A. Comply with ASTM D16 for interpretation of terms used in this section.
   B. Sheen Levels per MPI (APL) at 60 degree angle:
      1. Flat - gloss level 1, maximum 5 units.
      2. Eggshell - gloss level 3, maximum 10 units.
      3. Satin - gloss level 4, 20 to 35 units.
      4. Semi-Gloss - gloss level 5, 35 to 70 units.
      5. Gloss - gloss level 6, 70 to 85 units.

1.04 REFERENCE STANDARDS
   C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

1.05 SUBMITTALS
   A. See Section 01 3000 - 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.
   C. Draw downs: Supply two (2) professional quality drawdowns for each finished product and/or color. Manufacturer’s product information number and complete color formula must be included with each drawdown. Paint samples shall be submitted on 8-1/2-inch by 11-inch Mead Mark I cover paper, coated one side, with paint sprayed or applied with a foam rubber roller. Approved draw downs shall be turned over to the Owner/District at the time of the submittal for their record use.
   D. Stain Samples: Supply two (2) stain sample boards (12-inch square) for each stain color specified. Samples shall be made from the same wood species specified for doors, casework and/or trim. Samples shall be finished according to Section 2.6c.
   E. Product Data Sheets: Submit Manufacturers’ printed specifications and data sheets for each type of paint and other finishing materials proposed to be utilized. These submittals shall be for each system (MPI) listed below.
   F. Extra Stock: The Painting Contractor shall provide the Owner the opportunity to any full unused gallon(s) to determine if they would like to retain as part of extra stock. Also, for any projects with Zolatone Flex; there shall be 2 Quick Fix Sheets for every 20 gallons given to the Owner for their extra stock of the Zolatone as well as any full unused gallon(s) to determine if they would like to retain as part of extra stock. Any and all extra stock shall be stored at the school, typical.
   G. The Painting Contractor shall furnish 2 copies of the Maintenance Project Color Manual and Product Information Package to the Prime Contractor who will then turn over to the Owner. Included within the Owner’s Manual shall be the paint draw downs specific to the project with the label including the formula directly on it for the specified manufacturer.
H. Mock-up shall be completed of the specialty wall finishes (minimum of 100 square feet) of each specified coating system on each surface type. This shall demonstrate aesthetic effects as well as qualities of materials and execution. Upon acceptance by the Architect/Owner, mock-ups shall serve as standard for the work. Mock-up may remain as part of the completed Project; therefore, the location shall be determined during the Pre-Painting Conference. If Mock-up may remain as part of completed project; Owner will determine after approved.

1.06 QUALITY ASSURANCE
A. Pre-Painting Conference: Prior to the start of painting and after approval of required shop drawings and samples, the General Contractor shall arrange a Pre-painting Conference at the project site at a pre-arranged time approved by the Architect/Owner. The conference shall include in attendance the painting subcontractor and his/her jobsite foreperson. The Contractor shall record discussions and agreements that are made which are not specifically addressed in the Contract Documents, and shall furnish a copy to all involved participants.
B. Applicator Qualifications
   1. This contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work. When requested, contractors shall provide a list of the last three comparable jobs including: name and location, specifying authority/project manager, start/completion dates and value of painting work.
C. Products and Manufacturers
   1. All materials, preparation and workmanship shall conform to requirement of the LATEST EDITION of the architectural painting specification manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual).
   2. All paint manufacturers and products used shall be listed under the approved product list section of the MPI Painting Manual.
D. Single Source Responsibility
   1. Provide primer and undercoat in accordance with manufacturers recommendations for selected MPI approved topcoat. (See Section 1.2 Submittals.)

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials (all paints, varnishes, enamels, stains and similar materials) to Project site in manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label and the following information:
   1. Product name of title of material.
   2. Product description (generic classification of binder type).
   3. Federal Specification numbers if applicable.
   4. Manufacturer’s name, stock number and date of manufacture.
   5. Contents by volume, for pigment and vehicle constituents.
   6. Thinning instructions.
   7. Application instructions.
   8. Application instructions.
   9. Color name and number.
   10. VOC content.
B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C) and/or as recommended by manufacturer. Maintain storage containers in a clean condition, free of foreign materials and residue.
C. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily from the building every night and take every precaution to avoid the danger of fire.

1.08 FIELD CONDITIONS & QUALITY CONTROL
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 above the dew point, or to damp or wet surfaces.
D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer’s instructions.
E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
F. Frames and Doors shall be given their first coat of paint and stain/varnish before glass is installed.
G. First Coat Inspection: When a coat of material has been applied, the Painting Subcontractor shall inform the Architect/Engineer so that the work may be inspected and approved. Credit for succeeding coats will not be given unless the preceding coat has been so examined and approved.

1.09 COLOR SCHEDULE
A. Standard Palette
B. The Owner’s standard color palette will not be changed or altered in any manner.

PART 2 : PAINT MATERIALS
2.01 MANUFACTURERS
A. As stated in Section 1.3 Quality Assurance, only MPI approved manufacturers will be accepted – refer to MPI Approved Product Section.

2.02 PRODUCTS
A. As stated in Section 1.3 Quality Assurance, only MPI approved products (as specified) will be accepted. See Section 2.6 Paint Systems.

2.03 PRIMER AND UNDERCOAT
A. As stated in Section 1.3 Quality Assurance, provide primer and undercoat in accordance with manufacturer’s recommendations for selected MPI approved topcoat.

2.04 HIGH PERFORMANCE COATINGS
A. Specifier’s Requirement
B. When and where required, the specifier may choose from MPI approved high performance coatings.
C. Coating must be approved for the corresponding substrate and will be specified by the appropriate MPI number.
D. Specifier will not change or alter Owner’s approved paint systems (Section 2.6).

2.05 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. 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:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      b. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added
at project site; or other method acceptable to authorities having jurisdiction.

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 in Color Schedule.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.06 PAINT SYSTEMS
A. The below listed manufacturers: Sherwin Williams, PPG Paints, Benjamin Moore & Co. and Tnemec are all pre-approved manufacturers in accordance to the below listed manufacturers products and MPI Categories. This does not exclude other manufacturers; however, they must have equal product, be submitted for review and pre-approved by the Owner prior to being a part of the project.

1. New Metal - Ferrous
Surface Preparation: SSPC, SP-6 Commercial Blast Clean.
Prime: Tnemec Series 94H20 at 2.5 to 3.0 dry mils.
MPI Category: single component moisture cured zinc
MPI # PPG Paints: Amercoat 68 MCZ Zinc Rich Primer. 2.0-5.0 dft
MPI #200 Sherwin Williams: Corothane-Galva-Pac B65G11. 2.0-4.5 dft
Interm.: Tnemec Series 1075 at 2.5 to 3.0 dry mils.
MPI Category: 2 component polyurethane Semi-Gloss
MPI # PPG Paints: Amercoatshield 450 High Solids Semi-Gloss. 2.0-5.0 dft
MPI #174 Sherwin Williams: Acrolon HS Polyurethane 218.
B65W600 Series 2.5-3.5 dft
Finish: Tnemec Series 750-(color) at 2.5 to 3.0 dry mils.
MPI Category: 2 Component polyurethane, Semi-Gloss
MPI # PPG Paints: Amercoatshield 450 High Solids Semi-Gloss. 2.0-5.0 dft
MPI #174 Sherwin Williams: Acrolon HS Polyurethane 218.

2. New Metal – Galvanized
Surface Preparation: Brush Blast to remove oxides and etch the surface.
Prime: Tnemec Series 135 at 2.5 to 3.0 dry mils.
MPI Category: High Build, self-priming, Low-Gloss
MPI #108 PPG Paints: Amerlock 400. 4.0-8.0 dft
MPI #120 Sherwin Williams: Macropoxy 646 FC Epoxy, B58-600 Series. 4.0-7.0 dft
Finish: Tnemec Series 750–(color) at 2.5 to 3.0 dry mils.
MPI Category: 2 Component polyurethane, Semi-Gloss
MPI # PPG Paints: Amercoatshield 450 High Solids Semi-Gloss. 2.0-5.0 dft
MPI #174 Sherwin Williams: Acrolon HS Polyurethane 218 B65W600 Series. 2.5-3.5 dft.

*INTERIOR SURFACES OF NEW EXTERIOR METAL DOORS AND METAL FRAMES, AND ALL SURFACES OF NEW VESTIBULE METAL DOORS AND FRAMES SHALL BE OF THE SAME ABOVE SYSTEM.

3. New CMU Walls
Surface Preparation: Clean and Dry
Prime: Not required. Manufacturer’s block filler is required.
Finish: (2 coats) Tnemec Series 180 (color) @ 110-130 sq.ft. gal/coat.
MPI Category: Latex, exterior, flat
MPI # (2 coats) PPG Paints Perma-Crete High Build Acrylic. 4-22
4. Existing CMU Walls
   Surface Preparation: Clean and Dry. Remove all existing paint not tightly bonded to the surface
   Prime: Tnemec Series 151 @ 175 to 200 sq. ft. per gallon.
   MPI Category: Alkali resistant, water based
   MPI #3 PPG Paints Seal Grip Universal Primer. 17-921.
   MPI #3 Sherwin Williams Loxon Concrete&Masonry Primer. A24W8300.

   Finish: (2 coats) Tnemec Series 156 (color) @ 6.0 dry mils per coat.
   MPI Category: Elastomeric, pigmented, exterior, water based, flat
   MPI #113 (2 coats) PPG Paints Perma-Crete Elastomeric Coating. 4-110.
   MPI #113 (2 coats) Sherwin Williams Conflex XL High Build Coating. A5W451

2.07 PAINT AND STAIN SCHEDULE - INTERIOR WORK

A. Surface Preparation: Clean and Dry.
   (1 Coat): MPI Category: Sealer, latex, interior
   MPI #50X-Green Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600
   MPI #50 PPG Paints, SPEEDHIDE Interior Latex Wall Primer/Sealer 6-2
   MPI #50 Benjamin Moore & Co., N534 Benjamin Moore

   Finish: (2 Coats): MPI Category: Latex, interior, Gloss Level 2
   MPI #50X-Green Sherwin Williams ProMar 200 Zero VOC Interior Latex Low Sheen, B24W2600
   MPI #44 PPG Paints, 6-4110 Interior Zero-VOC Latex Egg-Shelf
   MPI #53 Benjamin Moore & Co., N536 Benjamin Moore

B. New Gypsum Board – Walls
   Surface Preparation: Clean and Dry
   (1 Coat): MPI Category: Sealer, Latex, interior
   MPI #50X-Green Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600
   MPI #50 PPG Paints 6-2 Latex Primer/Sealer
   MPI #17 Benjamin Moore & Co., N023 Benjamin Moore & Co.

   Finish: (2 Coats): MPI Category: Light industrial coating, water based, Gloss Level 3
   MPI #151 Sherwin Williams: Pro-Industrial Precatylized Water based Epoxy Egg-Shel, K45 Series
   MPI #151 PPG Paints: Pitt-Glaze WB1 Precatylized Epoxy. 16-310.
   MPI #115 Benjamin Moore & Co., V450 Corotech Coatings

C. Existing Gypsum Board – Walls (Previously painted)
   Surface Preparation: Sand surface to de-gloss surface and create a uniformly sanded surface. Clean and Dry.
   (1 Coat): MPI Category: Bonding, Water based
   MPI #17 Sherwin-Williams Multi-Purpose Interior & Exterior Latex Primer Sealer B51-451 series
   MPI #17 PPG Paints Seal Grip Acrylic Universal Primer/Sealer, 17-921 Series
   MPI #6 Benjamin Moore & Co., N023 Benjamin Moore

   Finish: (2 Coats): MPI Category: Light industrial coating, water based, Gloss Level 3
MPI #151 Sherwin Williams: Pro-Industrial Precatylized Water based Epoxy, Eg-Shel, K45 Series.
MPI #151 PPG Paints: Pitt-Glaze WB1 Precatylized Epoxy. 16-310.
MPI #115 Benjamin Moore & Co., Acrylic Epoxy V450 Corotech Coatings

D. New CMU Walls
Surface Preparation: Clean and Dry.
(1 Coat): Tnemec Series 54WB Surface Coat, one coat at 80 sq. ft. / gal. to fill voids and pinholes.
MPI Category: Block Filler, Latex, Interior/Exterior
MPI #4 PPG Paints: Speedhide Acrylic Block Filler 3040 6-15XI One coat at 75 Sq ft /gallon.
Finish: (2 Coats): Tnemec Series 113 H.B. Tneme-Tufcoat - (color) at 140 sq. ft. / gal. per coat.
MPI Category: Light industrial coating, water based, Gloss Level 3
MPI #151 PPG Paints: Pitt-Glaze WB1 Precatylized Epoxy. 16-310.150-175 sq. ft/gallon.
MPI #151 Sherwin Williams: Pro-Industrial Precatylized Water based Epoxy, Eg-Shel, K45 Series. 150-175 sq. ft/gallon.

E. Existing Interior CMU Walls
Surface Preparation: Clean and Dry. Remove all existing paint not tightly bonded to the surface
(1 Coat): Tnemec Series 151 @ 200 to 300 sq. ft. per gallon.
MPI Category: Alkali resistant, water based
MPI #17 PPG Paints Seal Grip Universal Primer. 17-921.
MPI #3 Sherwin Williams: Loxon Concrete&Masonry Primer. A24W8300.
Finish: (2 Coats): Tnemec Series 113 (color) @ 200 to 250 sq. ft. per gallon
MPI Category: Light industrial coating, water based, Gloss Level 3
MPI #151 PPG Paints: Pitt-Glaze WB1 Precatylized Epoxy. 16-310.
MPI #151 Sherwin Williams: Pro-Industrial Precatylized Water Based Epoxy, Eg-Shel, K45 Series.

F. Existing Hollow Metal Doors, Frames, and Miscellaneous Metals
Surface Preparation: Brush Blast to remove oxides and etch the surface.
Clean and Dry.
(1 Coat): Self- Priming
Finish: (2 Coats): Tnemec Series 1029 at 2.5 to 3.5 dry mils.
MPI Category: Light industrial coating, water based
MPI #151 PPG Paints: Pitt-Tech Plus DTM Satin. 90-1110.
MPI #151 Sherwin Williams: Pro-Industrial DTM Acrylic Eg-Shel, B66W1250 Series.

G. New Hollow Metal Doors, Frames, and Miscellaneous Metals
Surface Preparation: Clean and Dry.
(1 Coat): Tnemec Series 10 Tnemec Primer at 2.5 to 3.0 mils
MPI Category: Rust Inhibitive, Water based
MPI #107 PPG Paints: Pitt-Tech Plus DTM Primer. 90-912.2-4df
MPI #107 Sherwin Williams: Pro-Industrial Pro-Cryl Universal Acrylic Primer B66-310 Series
Finish: (2 Coats): Tnemec Series 1029 (color) Enduratone.
MPI Category: Light industrial coating, Water based
MPI #151 PPG Paints: Pitt-Tech Plus DTM Satin. 90-1110.
MPI #151 Sherwin Williams: Pro-Industrial DTM Acrylic Eg-Shel, B66W1250 Series.

H. New Wood (Painted)
Surface Preparation: Clean and Dry.
(1 Coat): MPI Category: Latex for interior wood
MPI #39 Sherwin Williams, Multi-purpose Primer/Sealer, B51-451 Series.
MPI #4539 PPG Paints Interior Woodwork Primer/Sealer Seal Grip 17-921
MPI #45 Benjamin Moore & Co., 024 Benjamin Moore
Finish: (1 Coat): MPI Category: Latex Interior Gloss Level 3
MPI #52 Sherwin Williams, ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series
MPI #54 & #54X PPG Paints Latex 6-500 Semi-Gloss Interior Wall and Trim Enamel
MPI #51 Benjamin Moore & Co., C235 Benjamin Moore

I. Overhead (joists, decking, duckwork, etc.)
Surface preparation: Clean and Dry
(1 Coat): Tnemec Series 115 – (color) Uni-Bond at 2.5-3.0 dry mils
MPI Category: Latex, Gloss Level 3
MPI #155 PPG Paints: Super-Tech Acrylic Dry-Fall Satin. 6-724XI.
MPI #152 Sherwin-Williams: Waterborne Acrylic Dryfall Eg-Shel B4 2W2.

1. Wood, Opaque, Acrylic, 3 Coat:
   a. One coat of latex primer sealer.

2. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   a. One coat of alkyd primer.

3. Ferrous Metals, Primed, Alkyd, 2 Coat:
   a. Touch-up with alkyd primer.

4. Gypsum Board/Plaster, Latex, 3 Coat:
   a. One coat of latex primer sealer.
   c. Flat: Two coats of latex enamel; S-W ProMar 200 Zero VOC Latex Flat B30-2600 Series 44 g/L VOCs.

2.08 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. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
B. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
C. Start of painting will be construed as Applicator’s acceptance of surfaces and conditions within a particular area.
D. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
E.

1.

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. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
D. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
   1. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
      a. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
   2. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer’s written instructions for each particular substrate condition and as specified.
      a. Provide barrier coats over incompatible primers or remove and reprime.
E. Cementitious Materials: Prepare concrete unit masonry and plaster surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
   1. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
   2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Tests shall be performed by the Contractor. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer’s written instructions.
F. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   2. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back side of wood, including cabinets, counters, cases, and paneling.
   3. If transparent finish is required, backprime with spar varnish.
4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

G. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC’s recommendations.
1. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
2. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

H. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment form galvanized sheet metal fabricated from coil stock by mechanical methods.

I. Material Preparation: Mix and prepare paint materials according to manufacturer’s written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

J. Seal surfaces that might cause bleed through or staining of topcoat.


3.03 APPLICATION
A. General: Apply paint according to manufacturer’s written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, grilles, convextor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to
manufacturer’s written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted.

3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer’s written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep’s wool as recommended by manufacturer for material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required. Provided the application by spray occurs on wall surfaces it shall be followed by a roller typical.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer’s recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having “all-service jacket” or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
K. Completed Work: Match approved samples for color, texture, and coverage.
L. Remove, refinish, or repaint work not complying with requirements.
M. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
N. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
O. Sand wood and metal surfaces lightly between coats to achieve required finish.
P. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
Q. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL
A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied.
1. Owner may engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.05 MARKING AND IDENTIFYING SMOKE AND FIRE RATED CONSTRUCTION
A. Provide permanently stenciled identification at fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions, and any other wall required to have protected openings or penetrations. Such identification shall:
1. Be located in accessible concealed floor, floor-ceiling, and attic spaces.

3.06 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT
A. Paint shop-primed equipment, where indicated.
B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.07 CLEANING
A. Cleanup: At the end of each workday, remove empty trash cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.08 PROTECTION
A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
B. Provide “Wet Paint” signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

3.09 COMPLETION
A. Upon completion of Project, remove all non-finish materials and rubbish from job site.
B. Leave gallon(s) of each finish material and/or color that the Owner flagged as maintaining for extra stock, clearly labeled and in usable condition.
C. Draw downs will be required at completion clearly labeled to include the formula.

END OF SECTION
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SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. High performance coatings.
B. Surface preparation.

1.02 RELATED REQUIREMENTS
A. Section 09 0600 - Color Schedule: High performance coating manufacturer and color.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide complete list of all 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 coating system(s) product is to be used in; include description of each system.
C. Samples: Submit four samples 6 by 12 inch in size illustrating specified colors for approval.
D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 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 coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS
A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
B. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
C. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
E. Restrict traffic from area where coating is being applied or is curing.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Provide high performance coating products 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. High-Performance Coatings:
   3. Substitutions: Section 01 6000 - Product Requirements.
2.02 TOP COAT MATERIALS
A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
   2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
   3. Colors: See Section 09 0600 - Color Schedule.

2.03 HIGH PERFORMANCE COATING SYSTEMS - INTERIOR
A. Metal Decking, Structural Components, Duct Work, Conduit and Piping in exposed ceiling locations, 1 Coat:
   1. Surface Preparation; Surface must be clean and dry.
   2. Eggshell: One coat; Tnemec Series 115-(color) @ 2.5-3.0 dry mils.

B. Shellac: Pure, white type.

2.04 PRIMERS
A. Primers: As recommended by coating manufacturer for specific substrate.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Do not begin application of coatings until substrates have been properly prepared.
C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION
A. Prepare surfaces as described in PART 2, High Performance Coating Systems Articles.
B. Clean surfaces of loose foreign matter.
C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
D. Remove finish hardware, fixture covers, and accessories and store.

3.03 PRIMING
A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION
A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.
B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING
A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
B. Clean surfaces immediately of overspray, splatter, and excess material.
C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION
A. Protect finished work from damage.

3.07 SCHEDULE - HIGH-PERFORMANCE COATING SYSTEMS
A. See Room Finish and Door Schedules on drawings.
B. Do Not Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. Fire rating labels, equipment serial number and capacity labels.
   3. Equipment identification or rating plates.
   4. Items with exposed surfaces of acoustical materials, anodized aluminum, stainless steel, chrome plating, copper, bronze, or glass.

C. Finish the surfaces described in PART 2, High Performance Coating Systems Articles, and as follows:

**3.08 COLOR SCHEDULE**

A. Colors: See Section 09 0600 - Color Schedule.

**END OF SECTION**
SPECIALTIES
SECTION 10 1400
SIGNAGE

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Cash allowance for signs.
   B. Signs required by code or reference standard.

1.02 PRICE AND PAYMENT PROCEDURES
   A. See Section 01 2100 - Allowances, for cash allowances affecting this section.
   B. Allowance amount covers purchase and delivery but not installation.

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. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign
      styles, font, foreground and background colors, locations, overall dimensions of each sign.
   C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication,
      including room number, room name, other text to be applied, sign and letter sizes, fonts, and
      colors.
      1. When room numbers to appear on signs differ from those on drawings, include the
         drawing room number on schedule.
      2. When content of signs is indicated to be determined later, request such information from
         Owner through Architect at least 2 months prior to start of fabrication; upon request,
         submit preliminary schedule.
      3. Submit for approval by Owner through Architect prior to fabrication.
   D. Samples: Submit two samples of each type of sign, of size similar to that required for project,
      illustrating sign style, font, and method of attachment.
   E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or
      chips.
   F. Verification Samples: Submit samples showing colors specified.
   G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Package signs as required to prevent damage before installation.
   B. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS
   A. Do not install tape adhesive when ambient temperature is lower than recommended by
      manufacturer.
   B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Flat Signs:
2.02 SIGNAGE APPLICATIONS
A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
B. Code Required Signs: Provide signs in accordance with applicable code to obtain Certificate of Occupancy.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Include International symbol of Accessibility at all accessible exits, areas of refuge, rest rooms and other areas as required by code.
   4. Character Height: 1 inch.
   5. Sign Height: 4 to 8 inches, unless otherwise indicated.
   6. Egress Stairways and Exit Discharges: Identify each door with "EXIT" text, pictogram and braille. Provide stairway floor number signs at each floor landing in stair enclosures connecting four or more floors, text and braille.
   7. Accessible Rest Rooms: Identify with "MEN" and "WOMEN" text, pictogram and braille.

2.03 SIGN TYPES
A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.

2.04 TACTILE SIGNAGE MEDIA
A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

2.05 ACCESSORIES
A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install neatly, with horizontal edges level.
C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION
SECTION 10 2113.19
PLASTIC TOILET COMPARTMENTS

PART 1  GENERAL

1.01 SECTION INCLUDES
   A. Solid plastic toilet compartments.

1.02 RELATED REQUIREMENTS
   A. Section 09 0600 - Color Schedule: Toilet compartment and screen manufacturer and color.
   B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data on panel construction, hardware, and accessories.
   C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
   D. Samples: Submit two samples of partition panels, 3 inch by 3 inch in size illustrating panel finish, color, and sheen.
   E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2  PRODUCTS

2.01 MANUFACTURERS
   A. Solid Plastic Toilet Compartments:
      1. Scranton Products; Aria Partitions: www.scrantonproducts.com/#sle.
      3. Legacy Polymer Products, Inc.;

2.02 PLASTIC TOILET COMPARTMENTS
   A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
   B. Minimum Class B flame spread.
   C. Doors:
      1. Thickness: 1 inch.
      2. Width: 30 inch.
      3. Verify with available clearances and TBA placement.
      4. Width for Accessible Use: 36 inch.
      4. Height: 55 inch.
   D. Panels:
      1. Thickness: 1 inch.
      2. Height: 55 inch.
   E. Pilasters:
      1. Thickness: 1 inch.
      2. Width: As required to fit space; minimum 3 inch.

2.03 ACCESSORIES
   A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
      1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
B. Head Rails: Extruded aluminum, anti-grip profile.
   1. Size: 1 inch by 1-5/8 inch.
C. Wall and Pilaster Brackets: Stainless steel; continuous type.
D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
E. Hinges: Stainless steel, manufacturer's standard finish.
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Set to stand open approximately 15 degrees.
F. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.
   4. Nylon bearings
G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.
H. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish at exposed bottom edges of panel.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify that field measurements are as indicated on shop drawings.
   C. Verify correct spacing of and between plumbing fixtures.
   D. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION
   A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
   B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
   C. Attach panel brackets securely to walls using anchor devices.
   D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES
   A. Maximum Variation From True Position: 1/4 inch.
   B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING
   A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
   B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
   C. Adjust adjacent components for consistency of line or plane.

END OF SECTION
SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Fiberglass reinforced plastic panels.

1.02  RELATED REQUIREMENTS
   A. Section 09 0600 - Color Schedule: Manufacturer, model and color.

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements for submittal procedures.
   B. Product Data: Indicate physical dimensions, features, anchorage details, and trim accessories.
   C. Shop Drawings: Include plans, elevation, sections, and attachment details.
   D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
   E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   F. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05  DELIVERY, STORAGE, AND HANDLING
   A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
   B. Protect work from moisture damage.
   C. Protect work from UV light damage.
   D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
   E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2  PRODUCTS
2.01  MANUFACTURERS
   A. Fiberglass Reinforced Plastic Panels:
      1. Crane Composites; www.cranecomposites.com

2.02  PRODUCT TYPES
      1. Texture: Smooth on exposed surface; smooth back surface.
      2. Surface Burning Characteristics: Flame spread index of 20 or less; smoke developed index of 400 or less when tested in accordance with ASTM E84 using adhesive recommended by manufacturer.
      3. Barcol Hardness (scratch resistance) of 55 as per ASTM D2583.
      4. Thickness: 0.075 inch.
      5. Product, Color, and Finish: See 09 0600 Color Schedule on Drawings.
      6. Accessories:
         a. Stainless steel Sani-Base where indicated on drawings.
         b. Stainless steel Outside Corner (OC) where indicated on drawings.
c. Standard one-piece PVC moldings at seams, inside corners, and tops/bottoms of panels unless noted otherwise.

B. Adhesives and Primers: As recommended by manufacturer.

C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.03 FABRICATION
   A. Fabricate components with tight joints, corners and seams.
   B. Pre-drill holes for attachment.
   C. Form end trim closure by capping and finishing smooth.
   D. Provide mounting brackets, attachment hardware, trims and adhesive required for a complete installation.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
   B. Verify that field measurements are as instructed by the manufacturer.
   C. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION
   A. Install components in accordance with manufacturer’s instructions, level and plumb, secured rigidly in position to supporting construction.

3.03 CLEANING
   A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION
SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Commercial toilet accessories.
   B. Electric hand/hair dryers.
   C. Diaper changing stations.
   D. Utility room accessories.

1.02  RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.
   B. Section 08 8000 - Glazing: Other mirrors.
   C. Section 10 2113.19 - Plastic Toilet Compartments.

1.03  REFERENCE STANDARDS
   D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
   C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2  PRODUCTS
2.01  MANUFACTURERS
   A. Commercial Toilet, Shower, and Bath Accessories:
      5. McKinney/Parker:
      6. Substitutions: Section 01 6000 - Product Requirements.
   B. Provide products of each category type by single manufacturer.

2.02  DESIGN REQUIREMENT
   A. Locate toilet paper holders in toilet partitions back to back. Secure both units with through bolts.
   B. Electric Hand Dryer to be utilized for all new Group Toilet Rooms.
   C. Paper Towel Dispensers with disposals to be utilized at Individual Toilet Rooms.
   D. Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner.
2.03 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. Keys: Provide 6 keys for each accessory to Owner; master key lockable accessories.
C. Stainless Steel Sheet: ASTM A666, Type 304.
D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
   1. Mirror shall be secured to hanger(s) with concealed Phillips head locking screws located in bottom of frame.
F. Adhesive: Two component epoxy type, waterproof.
G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.04 FINISHES
A. Stainless Steel: Satin finish, unless otherwise noted.
B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.05 COMMERCIAL TOILET ACCESSORIES
A. Toilet Paper Dispenser (TBA-3): Double roll, surface mounted bracket type, stainless steel, eccentric-shaped plastic spindle for 1/2 revolution delivery designed to prevent theft of tissue roll.
   1. Products:
      a. B-2740 manufactured by Bobrick.
B. Paper Towel Dispenser (TBA-1): Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 400 multifold minimum.
   2. Products:
      a. B-263 manufactured by Bobrick.
C. Soap Dispenser (TBA-2): OPS Provided, Contractor Installed.
D. Mirrors (TBA-7): Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Size: 18 x 30 inches.
   2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   4. Products:
      a. B-290 1830 manufactured by Bobrick.
E. Grab Bars (TBA-5): Stainless steel, textured surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) B-6806 manufactured by Bobrick.
F. Sanitary Napkin Disposal Unit (TBA-4): Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   1. Products:
      a. B-270 manufactured by Bobrick.

2.06 ELECTRIC HAND/HAIR DRYERS
A. Electric Hand Dryers (TBA-9): Traditional fan-in-case type, with downward fixed nozzle, heated air.
   3. Cover: Stainless steel with brushed finish.
      a. Tamper-resistant screw attachment of cover to mounting plate.
   4. Electric Hand Dryer Products:
      a. QuietDry Series TrimDry, Surface-Mounted ADA Dryer.
         1) B-7128 by Bobrick
         2) Voltage: 115V AC

2.07 DIAPER CHANGING STATIONS
A. Diaper Changing Station (TBA-6): Wall-mounted, horizontal, folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285 and bag hook.
   1. Material: Polyethylene.
   3. Color: Grey 01 with Stainless Steel Veneer.
   4. Products:
      a. KB300-SS manufactured by Koala Kare.
      b. 310-54-KIT Stainless Bag Hook manufactured by Koala Kare.

2.08 UTILITY ROOM ACCESSORIES
A. Combination Utility Shelf/Mop and Broom Holder (TBA-8): 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: 24 inches.
   5. Products:
      a. B-223 manufactured by Bobrick.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing 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 06 1000 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.02 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, ADA Standards and ICC A117.1 unless otherwise indicated.

END OF SECTION
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SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Fire extinguishers.
B. Fire extinguisher cabinets.
C. Accessories.

1.02  REFERENCE STANDARDS
A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
B. UL (DIR) - Online Certifications Directory; Current Edition.

1.03  SUBMITTALS
A. See Section 01 3000 - 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.
E. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.
F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04  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:
B. Fire Extinguisher Cabinets and Accessories:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02  FIRE EXTINGUISHERS
A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) for the purpose specified and indicated.
B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   2. Finish: Baked polyester powder coat red color.
   3. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03  FIRE EXTINGUISHER CABINETS
A. Cabinet Configuration: Recessed type.
B. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch.
   Hinge doors for 180 degree opening with continuous piano hinge.
C. Door Style: Vertical duo panel.
D. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
F. Fabrication: Weld, fill, and grind components smooth.
G. Finish of Cabinet Interior: White colored enamel.

2.04  ACCESSORIES
A. Extinguisher Brackets: Formed steel, chrome-plated.
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. Install cabinets plumb and level in wall openings, 48 inches from finished floor to center of door pull.
   C. Install extinguisher brackets, 48 inches from finished floor to center of extinguisher.
   D. Secure rigidly in place.
   E. Place extinguishers in cabinets.

3.03 SCHEDULES
   A. FE-1: Dry Chemical Type extinguisher with mounting bracket and graphic identification applied to wall surface above extinguisher.
   B. FEC-1: Recessed stainless steel cabinet with fire extinguisher type FE-1 (omit mounting bracket and graphic identification).

END OF SECTION
SECTION 10 7316.13
METAL CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Attached metal canopies.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

1.04 QUALITY ASSURANCE
A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
1. Comply with applicable code for submission of design calculations as required for acquiring permits.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials to project site ready for erection.
B. Package using methods that prevent damage during shipping and storage on site.
C. Store materials under cover and elevated above grade.

1.06 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Metal Canopies:
      a. Super Lumideck Cantilever
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL CANOPIES
A. Shop Fabricated Metal Canopy
B. Performance Requirements:
   1. Pre-engineered system complying with ASTM E2950.
   2. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
   3. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.03 COMPONENTS
A. Decking: 3 inch extruded flat soffit .078 decking.
B. Intermediate members: Alloy 6063-T6 extruded aluminum.
C. Fascia: Manufacturer's standard [12" C-Channel] profile.
D. Concealed drainage directed to fascia drain.

2.04 SHOP FABRICATION
A. Provide a complete system ready for erection at project site.
B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
C. Weld steel members in accordance with AWS D1.1/D1.1M.
D. Fabricate connections for bolt, nut, and washer connectors.

2.05 FINISHES
A. 2-Coat Kynar Finish: Color as selected from manufacturer's standard range.

2.06 ACCESSORIES
A. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.

PART 3 EXECUTION
3.01 EXAMINATION
A. Examine substrates and site area for conditions that might prevent satisfactory installation.
B. Verify that foundation, electrical utilities, and placed anchors are in correct position.
C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING
A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.
B. Set column base plates with non-shrink grout to achieve full plate bearing.
C. Fasten columns to anchor bolts.
D. Do not field cut or alter structural members without approval.
E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING
A. Install in accordance with manufacturer's instructions.
B. Fasten metal decking to metal support members, aligned level and plumb.
C. Install fascia panels, trim, and flashing.
D. Separate dissimilar metals using concealed bituminous paint.
E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 CLEANING
A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 PROTECTION
A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION
CONVEYING EQUIPMENT
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SECTION 14 4200
WHEELCHAIR LIFTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Vertical platform wheelchair lifts.
B. Maintenance contract.

1.02 REFERENCE STANDARDS
F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
N. ITS (DIR) - Directory of Listed Products; Current Edition.
O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
P. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS
A. Coordination: Coordinate installation of wheelchair lift system with adjacent construction using necessary attachments; provide anchoring devices in accordance with manufacturer's installation instructions; coordinate installation of cast-in-place concrete components.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Include data on material descriptions, construction details, component dimensions and profiles, and finishes; include data on rated capacities, electrical and operating characteristics, and necessary accessories.
C. Shop Drawings: Include plans, elevations, sections, and attachment details; include equipment assembly details with dimensions, weights, loads, required clearances, components, size and location of anchors and required field connections, and methods for field assembly; provide diagrams indicating signal, power, and control wiring.
D. Designer's qualification statement.
E. Installer's qualification statement.
F. Testing agency's qualification statement.
G. Maintenance contracts.
H. Executed warranty.
I. Maintenance Materials: Provide the following for Owner's use in maintenance of wheelchair lifts and equipment.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Spare Parts: Provide parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.

1.05 QUALITY ASSURANCE
A. Designer Qualifications: Provide wheelchair lift design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.06 WARRANTY
A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Manufacturer Warranty: Provide 2-year manufacturer warranty to repair or replace wheelchair lift system components that fail in materials or workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS
2.01 PERFORMANCE REQUIREMENTS
A. Regulatory Requirements: Comply with ASME A18.1, ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
B. Accessibility Requirements: Comply with ADA Standards and ICC A117.1.
C. Structural Performance: Comply with ASCE 7 for loading of wheelchair lift components and assemblies.
D. Perform welding of steel in accordance with AWS D1.1/D1.1M.
E. Perform electrical work in accordance with NFPA 70.

2.02 VERTICAL PLATFORM WHEELCHAIR LIFTS
A. Manufacturers:
      a. Basis of Design: Model GVL SW-168

B. Vertical Platform Wheelchair Lifts: Provide manufacturer's standard type that complies with indicated requirements. Use manufacturer's standard components for vertical platform wheelchair lifts as required for complete system unless otherwise indicated.
   1. Type of Vertical Platform Wheelchair Lift:
      a. Vertical platform wheelchair lift installed within field-fabricated shaftway provided by others; platform includes sidewalls in addition to optional shaftway access doors and frames as indicated on drawings.
   2. Configuration:
      a. Straight through entry/exit, with front and rear openings.
      b. Number of Stops: Two.
      c. Landing Openings, Self-Closing:
         1) Lower landing with shaftway-mounted door.
         2) Upper landing with shaftway mounted door.
   3. Location:
      a. Interior of building, as indicated on drawings.
   4. Lift Load Capacity: 750 lb, maximum.
   5. Lifting Height from Bottom to Upper Floor Level: As indicated on drawings.
   6. Platform Width Clearance: As indicated on drawings.
   7. Platform Length Clearance: As indicated on drawings.

9. Platform Floor: Steel sheet with matte finish, having overall thickness not greater than 1-1/2 inches.

10. Drive System:
   a. Roller chain hydraulic.
      1) Rated Speed: 17 fpm, nominal.

11. Drive System Enclosure: Provide rectangular galvanized steel tube frame with flush steel sheet panels on sides and top to enclose drive system components; securely attach enclosure to adjacent substrate.

C. Shaftway Wall Components: Prehung, doors mounted flush with inside wall of shaftway provided by others.
   1. Door Height: As indicated on drawings, at landings indicated.
   2. Door Width: As indicated on drawings, at landings indicated.
   3. Upper Gate: Extruded aluminum frame with 16 gauge, 0.0598 inch galvanized steel sheet lower panel kick plate, and galvanized steel sheet upper panel.

2.03 ELECTRICAL CHARACTERISTICS AND COMPONENTS
   A. Electrical Characteristics:
      1. 3 hp.
      2. 208 to 240 VAC, single-phase, 60 Hz.

   B. Platform Controls: Continuous pressure switch, one for each direction, with keyless operation.

   C. Emergency Operation: Provide manual operation, battery-powered system, and connection to standby electrical power to raise or lower lift to landing due to malfunction or loss of power.

   D. Electrical Components, Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 and UL (DIR) or ITS (DIR) listed and labeled, and marked as applicable for proposed locations.

2.04 MATERIALS
   A. Rolled Steel Sections, Shapes, and Rods: Comply with ASTM A36/A36M.

   B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

   C. Rolled Steel Floor Plates: Comply with ASTM A786/A786M, 1/8 inch thick, with manufacturer's standard surface pattern; rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).

   D. Steel Tubing: Comply with ASTM A500/A500M, cold formed.

   E. Anchor Bolts and Rods: Comply with ASTM F1554, Grade 55.

   F. Welding: Comply with applicable requirements of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

2.05 EQUIPMENT
   A. Lubrication of Equipment: Provide grease fittings for lubricating bearings requiring periodic lubrication, automatic feed type grease cups, and visible and easily accessible lubrication points.

   B. Guide Rails, Ropes, Counterweights, Sheaves, Attachment Brackets, and Anchors: Sized in accordance with local building code, including safety factors.

   C. Maintenance Devices: Provide as necessary within wheelchair lift system, supported on structural members within accessible locations.

2.06 FINISHES
   A. Baked-On Factory Finish for Structural Metal Surfaces: Clean surfaces of rust, oil, or grease and wipe clean with solvent; apply manufacturer's standard two-coat, baked-on finish consisting of primer and thermosetting top coat.
      1. Color: Manufacturer's standard color.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that areas and conditions comply with installation tolerances and other conditions affecting this work.
   B. Verify that locations for electrical rough-in connections to system equipment are in acceptable locations before installing equipment.
   C. Verify that electrical power is available and of correct characteristics.
   D. Verify that walls, stairways and floors for wheelchair lift areas are plumb and square, and properly sloped for drainage.
   E. Do not proceed with installation until unacceptable conditions have been corrected.

3.02 PREPARATION
   A. Prepare surfaces of substrates using methods in accordance with lift manufacturer's installation instructions.
   B. Clean surfaces thoroughly before starting installation of lifts.

3.03 INSTALLATION
   A. Install wheelchair lift system and components in accordance with manufacturer's written installation instructions.
   B. Install wheelchair lift system securely to supporting structure, and flush with adjacent surfaces.
   C. Install structural components using methods that comply with requirements indicated relative to layout and structural position.
PLUMBING
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SECTION 22 0100
GENERAL REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   B. Division 21, 22 and 23 Conditions apply to this Section.

1.02 SUMMARY
   A. This Section includes general mechanical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of plumbing systems.
   B. Refer to Section 23 0100 for “General Requirements for Mechanical Systems.”
   C. Refer to Section 23 0500 for “Basic Mechanical Materials and Methods.”
   D. Refer to Section 23 0505 for “Basic Mechanical Piping Materials and Methods.”

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION (Not Applicable)

END OF SECTION
SECTION 22 0500
BASIC MATERIALS AND METHODS FOR PLUMBING

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following basic mechanical materials and methods and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of mechanical systems.

1. Indenting Devices and Labels
2. Grout
3. Sealants
4. Access Doors
5. Electrical Requirements
6. Motors
7. Mechanical Equipment Installation
8. Labeling and Identifying
9. Work in Existing Buildings
10. Construction Layout
11. Data and Measurements

1.03 DEFINITIONS
A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.04 SUBMITTALS
A. Product Data: For sealants and identification materials and devices.
B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
C. See “Submittal Schedule” at the end of Section 22 0500 – General Requirements for Plumbing.

1.05 QUALITY ASSURANCE
A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Each contractor shall make provisions for delivery and safe storage of materials. Materials shall be delivered in a timely manner to expedite the work.
B. Protect stored piping, supplies and equipment from cold, moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

1.07 COORDINATION
A. Coordinate mechanical equipment installation with other building components.
B. Arrange for pipe, duct and equipment spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.
G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.
H. Motors, equipment, controls, etc. shall be furnished, mounted and connected according to the following schedule unless otherwise noted (E = Electrical Contractor, P = Plumbing Contractor):

<table>
<thead>
<tr>
<th>Item</th>
<th>Furnished By</th>
<th>Set in place or mounted by</th>
<th>Power wiring and connection by</th>
<th>Control Wiring and connection by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>P</td>
<td>P</td>
<td>E</td>
<td>P</td>
</tr>
<tr>
<td>2)</td>
<td>Magnetic Motor Starters:</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>a)</td>
<td>Automatically controlled, with or without HOA switches.</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>b)</td>
<td>Automatically controlled, with or without HOA switches and furnished as part of factory-wired mechanical equipment</td>
<td>P</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>c)</td>
<td>Manually controlled</td>
<td>E</td>
<td>E</td>
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</tr>
<tr>
<td>d)</td>
<td>Manually controlled and furnished as part of factory-wired mechanical equipment</td>
<td>P</td>
<td>P</td>
<td>---</td>
</tr>
<tr>
<td>3)</td>
<td>Disconnect switches, thermal overload switches, manual operating switches</td>
<td>E</td>
<td>E</td>
<td>--</td>
</tr>
<tr>
<td>a)</td>
<td>Furnished as part of factory-wired mechanical equipment</td>
<td>P</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>b)</td>
<td>Loose mounted</td>
<td>E</td>
<td>E</td>
<td>--</td>
</tr>
<tr>
<td>4)</td>
<td>Transformers</td>
<td>E</td>
<td>E</td>
<td>--</td>
</tr>
<tr>
<td>a)</td>
<td>Serving 120 Volt and higher loads</td>
<td>P(1)</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>b)</td>
<td>Serving 24 Volt control power</td>
<td>P</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>5)</td>
<td>Contactors</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>6)</td>
<td>Push-button stations, pilot lights</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>7)</td>
<td>Multi-speed switches</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>a)</td>
<td>Furnished with equipment</td>
<td>P</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>b)</td>
<td>Loose mounted</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>8)</td>
<td>Line voltage thermostats and time clocks.</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>9)</td>
<td>Low voltage controls and thermostats</td>
<td>P</td>
<td>P</td>
<td>P(2)</td>
</tr>
<tr>
<td>10)</td>
<td>Motorized valves, and float controls for tanks and sumps</td>
<td>P</td>
<td>P</td>
<td>E</td>
</tr>
</tbody>
</table>

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11) Factory pre-wired control/power panels including remote sensing devices P P E P(3)
12) Heat tape E E E E
13) Boiler and water heater controls, boiler burner control panels P P E P

PART 2 - PRODUCTS
2.01 IDENTIFYING DEVICES AND LABELS
   A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
   B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
      1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
      2. Location: Accessible and visible location.
   C. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
      1. Fabricate in sizes required for message.
      2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
   D. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
   E. Valve Tags: 19 gauge, 1-1/2" diameter, polished brass, stamped or engraved ¼" high piping system abbreviation in and ½" high sequenced valve numbers.
      1. Valve tag fastener: solid brass wire link or beaded chain, or ‘S’-hook or size required for proper attachment of tags to valves.
   H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

2.02 GROUT
   A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
      2. Design Mix: 5000-psig, 28-day compressive strength.

2.03 SEALANTS
   A. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging for application in vertical and horizontal joints. Color as selected by architect.
   B. Accessories: Primer, joint cleaner, joint backing and bond breaker as recommended by sealant manufacturer to suit application.
   C. Firestopping Materials: Provide firestopping material to maintain required rating of all fire-resistant assemblies according to requirements of “Firestopping” section of this specification.

2.04 ACCESS DOORS
   A. Prime Coated 14 gauge steel, flush, with screw driver operated cam lock. Frame to accommodate construction type; size as indicated.

2.05 ELECTRICAL REQUIREMENTS
   A. Compliance for Mechanical Equipment
1. Comply with applicable requirements of the National Electric Code (NFPA 70)
2. Provide equipment and accessories that are listed and labeled as defined in NFPA 70
3. Comply with applicable requirements of Underwriters Laboratory (UL)
4. Comply with applicable requirements of NEMA standards

B. Electrical Wire
1. Wiring material shall be in accordance with the latest version of the National Electric Code (NFPA 70) and all applicable local codes and carry the UL label where applicable.
2. All exposed wiring in return air plenums shall be rate cable for fire and smoke spread.

2.06 MOTORS
A. BASIC MOTOR REQUIREMENTS
1. Motors ¾ HP and Larger shall be polyphase. Motors Smaller than ¾ HP shall be single phase unless otherwise indicated.
2. Frequency Rating shall be 60 Hz. Voltage Rating is determined by voltage of circuit to which motor is connected.
3. Service Factor: According to NEMA MG 1, unless otherwise indicated.
4. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
5. Enclosure: Open dripproof, unless otherwise indicated.

B. POLYPHASE MOTORS
1. General
   b. Stator: Copper windings, unless otherwise indicated. Multispeed motors have separate winding for each speed.
   c. Rotor: Squirrel cage, unless otherwise indicated.
   d. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
   e. Temperature Rise: Match insulation rating, unless otherwise indicated.
   f. Insulation: Class F, unless otherwise indicated.
2. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for indicated controller, with required motor leads brought to motor terminal box to suit control method.
3. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer. Inverter rated motors used in conjunction with variable speed drives shall be equipped with a shaft grounding ring. Grounding ring shall be AEGIS Model SGR uKIT, either solid or split ring design. Grounding ring may be epoxy mounted if manufacturer's conductive epoxy adhesive is used.
4. Rugged-Duty Motors: Where indicated, motors are totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings are insulated with nonhygroscopic material. External finish is chemical-resistant paint over corrosion-resistant primer.

C. SINGLE-PHASE MOTORS
1. Permanent-split capacitor, Split-phase start, capacitor run or capacitor start, capacitor run as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application.
2. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
3. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.

D. ELECTRONICALLY COMMUTATED MOTORS (ECM)
1. Permanent magnet type motor with near-zero rotor losses designed for synchronous rotation.
2. Brushless DC motor controlled by an integrated controller/inverter that operates the wounded stator and senses rotor position to electrically commutate the stator as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application. Coordinate input signal for speed with specific application.
3. Motor shall be designed to maintain a minimum 70 percent efficiency over the entire operating range.
4. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
5. Bearings: Sealed, prelubricated ball bearing type for poly-phase or single-phase motors.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
E. Install equipment giving right of way to piping installed at required slope.

3.02 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
   2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior non-concealed locations:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
      c. Near locations if pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
      d. At access doors, manholes, and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
      g. On piping above removable acoustical ceilings, except omit immediately spaced markers.
B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
C. Valve Tags:
   1. Install valve tag at all valves in piping systems listed below
      a. Domestic water (excluding individual fixture isolation valves)
   2. Provide reproducible set of drawings indicating all valve locations.
D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.03 FIRESTOPPING
A. Apply firestopping to all duct and pipe penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

### 3.04 CONCRETE BASES
- A. Construct concrete bases of dimensions indicated, but not less than 3-1/2" inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement.

### 3.05 DEMOLITION
- A. Disconnect, demolish, and remove Work specified in Division 22 Sections.
- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### 3.06 WORK IN EXISTING BUILDINGS
- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the construction period. Cooperate with the Owner to minimize conflicts with the Owner's operations.
- B. Schedule all work in advance with the owner. Do not proceed with work without the Owner's written approval.
- C. Notify Owner of noisy operations and schedule in advance.
- D. The Owner shall have the right to direct work to secure safe and proper progress and quality of work.
- E. Do not interrupt utilities without Owner's written approval of time and duration. Interruptions shall be minimum required for completion of work.
- F. The existing fire alarm system shall remain functional throughout the project. The Owner and the Fire Marshall shall approve required outages.
- G. The Owner shall be notified before starting welding or cutting. Fire extinguishers shall be immediately accessible when welding or cutting with an open flame or arc. Welding or cutting with an open flame or arc shall be stopped not less than one hour before leaving the premises.
- H. Existing plumbing items that interfere with the proper installation new work shall be removed or relocated as required or as directed by the Architect/Engineer.

### 3.07 CUTTING AND PATCHING
- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### 3.08 CONSTRUCTION LAYOUT
- A. Layout work in advance of installation using data and measurements from the site, the appropriate architectural and structural drawings and shop drawings.
- B. Confirm adequate clearance for installation, operation, maintenance and code required clearance including items installed by other contractors.
- C. If layout to provide clearance is not possible, promptly notify Architect/Engineer for clarification.

### 3.09 DATA AND MEASUREMENTS
- A. The data given herein and on the drawings is as accurate as could be secured. The existence and location of construction as indicated is not guaranteed. Before beginning work investigate and verify the existence and location of items affecting work. Obtain exact locations, measurements, levels, etc., at the site and adapt work to actual conditions.
- B. Only Architectural drawings, Structural drawings, and site measurements may be utilized in calculations. Mechanical and electrical drawings are diagrammatic or schematic.

### 3.10 PAINTING AND FINISHING
- A. Refer to individual sections for paint materials, surface preparation, and application of paint.
B. Do not paint piping specialties with factory-applied finish.
C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.11 ERECTION SUPPORTS AND ANCHORAGE
A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
B. Field Welding: Comply with applicable codes and standards.

3.12 GROUTING
A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix and place and cure grout according to manufacturer’s written instructions.

3.13 ACCESS
A. Provide access to all equipment, valves, controls, etc. as required for operation, repair and maintenance.
B. Access doors shall be provided when access through ceilings, chases, etc. is not provided by others.

3.14 ELECTRICAL WIRING
A. Install all electrical wiring in accordance with the National Electric Code and section 26 0100 of this specification.
B. All line voltage wire shall be installed in metal raceways.
C. All low voltage wire in equipment rooms and exposed in space shall be installed in metal raceways.

END OF SECTION
SECTION 22 0505
BASIC PIPING MATERIALS AND METHODS FOR PLUMBING

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following basic mechanical materials and methods to complement other Division 22 Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Escutcheons.
   3. Dielectric fittings.
   4. Flexible connectors.
   5. Mechanical sleeve seals.
   6. Pipe hangers and supports
   7. Meters and gages
B. Pipe and pipe fitting materials are specified in Division 22 piping system Sections.

1.03 DEFINITIONS
A. MSS: Manufacturer’s Standardization Society for the Valve and Fittings Industry.
B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS
A. Design support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.05 SUBMITTALS
A. Product Data: For dielectric fittings, mechanical sleeve seals, and each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated. Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified.
B. Maintenance Data: For meters and gages to include in maintenance manuals. Submit valve schedules to include in maintenance manuals for each piping system. Valve schedule shall indicate valve number, piping system and location of valve.
C. See “Submittal Schedule” located at the end of Section 22 0100 – General Requirements for Plumbing.

1.06 QUALITY ASSURANCE
A. Welders shall be qualified in accordance with applicable codes. Welding procedures and testing shall comply with ANSI B31.10 “Standard for Pressure Piping, Power Piping” and AWS Welding Handbook.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Dielectric Unions, Couplings, Flanges:
      a. Capitol Manufacturing Co.
      b. Central Plastics Co.
      d. Epco Sales Inc.
      e. Hart Industries International, Inc.
      g. Zurn Industries, Inc.; Wilkins Div.
   2. Mechanical Sleeve Seals:
      a. Calpico, Inc.
      b. Metraflex Co.
      c. Thunderline/Link-Seal.
3. Pipe Hangers and Supports:
   a. AAA Technology and Specialties Co., Inc.
   b. Anvil
   c. B-Line Systems, Inc.
   d. Carpenter & Patterson, Inc.
   e. Grinnell Corp. B-Line Systems, Inc.
   f. Grinnell Corp.; Power-Strut Unit.
   g. GS Metals Corp.
   h. Michigan Hanger Co., Inc.; O-Strut Div.
   i. National Pipe Hanger Corp.
   j. Thomas & Betts Corp.
   k. Unistrut Corp.
   l. Wesanco, Inc.
   m. Thermal-Hanger Shield Inserts

4. Thermometers:
   a. AMETEK, Inc.; U.S. Gauge Div
   c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   d. Ernst Gage Co.
   e. Marshalltown Instruments
   f. Miljoc Corporation
   g. Noshok, Inc.
   h. Rotemp Instrument Corp.
   i. Tel-Tru Manufacturing Co., Inc.
   j. Trelice: H. O. Trelice Co.
   k. Weiss Instruments, Inc.
   l. Winter's Thermogauges, Inc.

5. Pressure Gages:
   a. AMETEK, Inc.; U.S. Gauge Div.
   c. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   d. Ernst Gage Co.
   e. Marsh Bellofram.
   f. Miljoco Corporation
   g. Noshok, Inc.
   h. Trelice: H. O. Trelice Co.
   i. Weiss Instruments, Inc.
   j. WIKA Instruments Corp.
   k. Winter's Thermogauges, Inc.

6. Test Plugs:
   b. MG Piping Products Co.
   c. Miljoco Corporation
   d. National Meter.
   e. Peterson Equipment Co., Inc.
   f. Sisco Manufacturing Co.
   g. Trelice: H. O. Trelice Co.
   h. Watts Industries, Inc.; Water Products Div.

2.02 PIPE AND PIPE FITTINGS
   A. Refer to individual Division 22 piping Sections for pipe and fitting materials and joining methods.
   B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS
   A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
   B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
E. Solder Filler Metals: ASTM B32.
   1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
   2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
   3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
   4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
   5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.
F. Brazing Filler Metals: AWS A5.8.
   1. BCuP Series: Copper-phosphorus alloys.
   2. BAg1: Silver alloy.
G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
H. Solvent Cements: Manufacturer's standard solvent cements for PVC Piping. ASTM D2564. Include primer according to ASTM F656.
I. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
J. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
   2. Followers: ASTM A47 malleable iron or ASTM A536 ductile iron.
   5. Finish: Enamel paint.

2.04 DIELECTRIC FITTINGS
A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
C. Insulating Material: Suitable for system fluid, pressure, and temperature.
D. Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

2.05 MECHANICAL SLEEVE SEALS
A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.06 PIPING SPECIALTIES
A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
   1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
   2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
   3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
3. **Stamped Steel**: One piece, with set screw, spring clips, concealed hinge and chrome-plated finish.

2.07 **PIPE HANGERS AND SUPPORTS**

A. Pipe Hangers, Supports, and Components: factory-fabricated components.
   1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
   1. Coatings: Manufacturer’s standard finish, unless bare metal surfaces are indicated.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield. ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.

2.08 **MISCELLANEOUS PIPE SUPPORTING MATERIALS**

A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

D. Grout: ASTM C 1107, Grade B, factory-mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

2.09 **THERMOMETERS, GENERAL**

A. Scale Range: Temperature ranges for services listed are as follows:
   1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
   2. Domestic Cold Water: 0 to 120 deg F, with 1-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.10 **LIQUID-IN-GLASS THERMOMETERS**

A. Case: Die-cast aluminum with hard powder-coat finish, acrylic front, 9 inches long.

B. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

C. Tube: Blue reading, organic-liquid filled with magnifying lens.

D. Scale: Satin-faced nonreflective aluminum with permanently etched markings or white finished aluminum with black markings.

E. Stem: Die-cast aluminum for separable socket; of length to suit installation.

2.11 **DIRECT-MOUNTING, FILLED-SYSTEM DIAL THERMOMETERS**

A. Description: Vapor-actuated, universal-angle dial type.

B. Case: Stainless steel with 4-1/2-inch diameter, clear acrylic lens.

C. Adjustable Joint: Brass, 180-degree adjustment in vertical plane, with locking device.

D. Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.

E. Movement: Brass, precision geared.

F. Scale: Progressive, white finished aluminum with black markings.

G. Stem: Copper for separable socket; of length to suit installation.

2.12 **SEPARABLE SOCKETS (THERMOWELLS)**

A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.

1. Material: to match piping.

2. Extension-Neck Length: Nominal thickness of 2 inches, but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.

3. Insertion Length: To extend to one-third of diameter of pipe or 2 inches into pipe.
2.13 PRESSURE GAGES
A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.
B. Case: Stainless steel with 4-1/2-inch diameter, clear acrylic lens.
C. Connector: Brass, NPS 1/4.
D. Scale: White-coated aluminum with permanently etched markings or white finished aluminum with black markings.
E. Accuracy: Grade 1A, plus or minus 1 percent of full scale.
F. Range: Comply with the following:
   1. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure.
   2. Fluids under Pressure: Two times the operating pressure.
G. Gage Fitting Valves: NPS 1/4 brass or stainless-steel needle type.

2.14 TEST PLUGS
A. Description: Brass-body test plug in NPS 1/2 fitting.
B. Body: Length as required to extend beyond insulation.
C. Pressure Rating: 500 psig minimum.
D. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage adapter with probe.
E. Core Material for Air and Water: Nordel, good up to 350 deg F.
F. Core material for Natural Gas: Neoprene, good up to 200 deg F.
G. Test-Plug Cap: Gasketed and threaded cap, of same material as plug.
H. Test Kit: Pressure gage and adapter with probe, two 5-inch pocket testing thermometers with magnifying lens, and protective carrying case.
   1. Pressure Gage and Thermometer Ranges: Approximately two times the system’s operating conditions.

PART 3 - EXECUTION
3.01 PIPING SYSTEMS - COMMON REQUIREMENTS
A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.
B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
C. Install piping at indicated slope.
D. Install components with pressure rating equal to or greater than system operating pressure.
E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
F. Install piping free of sags and bends.
G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
K. Install fittings for changes in direction and branch connections.
L. Install couplings according to manufacturer's written instructions.
M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings.
N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.


Q. Fire-BARRIER Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.


5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:


7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to manufacturer's recommendations.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.02 HANGER AND SUPPORT APPLICATIONS

A. Comply with MSS SP-69 for pipe hanger selections and applications.

B. Comply with MSS SP-89 for fabrication and installation procedures.

C. Horizontal-Piping Hangers and Supports: Use swivel ring or clevis type hangers.

D. Vertical-Piping: Use riser clamps.

E. Saddles and Shields: Install of length recommended by manufacturer to prevent crushing insulation.
3.03 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer’s written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

D. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, “Building Services Piping,” is not exceeded.

I. Insulated Piping: Comply with the following:
   1. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   2. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   3. Do not exceed pipe stress limits according to ASME B31.9.
   4. Install protection saddles or thermal hanger shields, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   5. Install protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.

J. Support vertical piping and tubing at base and at each floor.

K. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
   1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   2. 1-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   3. 1-1/4-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   4. 1-1/2 and 2-Inch NPS: Maximum horizontal spacing, 96 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   5. 2-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   6. 3-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   7. 4- and 5-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   8. 6-Inch NPS: Maximum horizontal spacing, 10 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
   9. 8-Inch NPS: Maximum horizontal spacing, 10 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 10 feet.

L. Install hangers for steel, cast and ductile-iron piping with the following maximum spacing and minimum rod diameters:
1. 1-1/4-Inch NPS and Smaller: Maximum horizontal spacing, 84 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
2. 1-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
3. 2-Inch NPS: Maximum horizontal spacing, 10 feet with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
4. 2-1/2-Inch NPS: Maximum horizontal spacing, 11 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
5. 3-Inch NPS: Maximum horizontal spacing, 12 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
6. 4- and 5-Inch NPS: Maximum horizontal spacing, 12 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
7. 6-Inch NPS: Maximum horizontal spacing, 12 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 15 feet.
8. 8- through 12-Inch NPS: Maximum horizontal spacing, 12 feet with 7/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.

M. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:
1. 2-Inch NPS and Smaller: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
2. 2-1/2- to 3-1/2-Inch NPS: Maximum horizontal spacing, 48 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 48 inches.
3. 4- and 5-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
4. 6-Inch NPS: Maximum horizontal spacing, 48 inches with 3/4-inch minimum rod diameter; maximum vertical spacing, 48 inches.
5. 8-Inch NPS: Maximum horizontal spacing, 48 inches with 7/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

3.04 EQUIPMENT SUPPORTS
A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
C. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
D. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.05 METER AND GAGE INSTALLATION, GENERAL
A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.
B. Install meters and gages adjacent to machines and equipment to allow service and maintenance.
C. Calibrate meters and gauges according to manufacturer's written instructions, after installation.

3.06 THERMOMETER INSTALLATION
A. Install thermometers and adjust vertical and tilted positions.
B. Install thermometers at the following locations:
   1. Inlet and outlet of each domestic water heater tank.
C. Install separable sockets in vertical position in piping tees where fixed thermometers are indicated.
D. When thermometers are installed in piping 1” and smaller, install well in 1-1/4” with reducers to prevent restriction of flow.

3.07 PRESSURE-GAGE INSTALLATION
A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.
B. Install pressure gages at the following locations:
1. Discharge of each pressure-reducing valve.
2. Building water-service entrance.
3. Install liquid-filled-type pressure gages at suction and discharge of each pump.
C. Install pressure-gage needle valve and snubber in piping to pressure gages.

END OF SECTION
PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes general duty valves common to several mechanical piping systems. Special purpose valves are specified in Division 22 piping system Sections.

1.03 SUBMITTALS
   A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
   B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.
   C. Maintenance data for valves to include in the operation and maintenance manual specified in Division 01. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.
   D. See “Submittal Schedule” at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.04 QUALITY ASSURANCE
   A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
   B. All valves used in potable water service shall be certified lead free per NSF-61G and NSF 372.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. Gate Valves:
         a. Crane Company; Valves and Fitting Division.
         b. Hammond Valve Corporation.
         c. Kitz Corp. of America.
         d. Lunkenheimer/Cincinnati Valve Co.
         e. Milwaukee Valve Company, Inc.
         f. NIBCO Inc.
         g. Powell: Wm. Powell Company (The).
         h. Red-White Valve Corp.
         i. Stockham Valves & Fittings, Inc.
      2. Ball Valves:
         a. Conbraco Industries, Inc.; Apollo Division.
         b. Hammond Valve Corporation.
         c. Milwaukee Valve Company, Inc.
         d. NIBCO Inc.
         e. Stockham Valves & Fittings, Inc.
         f. Tyler Pipe.
         g. Victaulic Company of America.
      3. Butterfly Valves:
         a. Center Line, Mark Controls Corporation.
         b. Crane Company; Valves and Fitting Division.
         c. General Signal; DeZurik Unit.
         d. Grinnell Corp.
         e. Hammond Valve Corporation.
         f. Keystone Valve USA, Inc.
4. Check Valves:
   a. Cla-Val Co.
   b. Conbraco Industries, Inc.; Apollo Division.
   c. Hammond Valve Corporation.
   d. Keystone Valve USA, Inc.
   e. Kitz Corp. of America.
   f. Metraflex Company.
   g. Milwaukee Valve Company, Inc.
   h. NIBCO Inc.
   i. Red-White Valve Corp.
   j. Stockham Valves & Fittings, Inc.
   k. Tyler Pipe.
   l. Ultraflo Corporation.
   m. Victaulic Company of America.

2.02 BASIC, COMMON FEATURES
   A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
   B. Sizes: Same size as upstream pipe, unless otherwise indicated.
   C. Operators: Use specified operators and handwheels, except provide the following special operator features:
      1. Handwheels: For valves other than quarter turn.
      2. Lever Handles: For quarter-turn valves 6 inches and smaller.
      3. Memory Stops: For balancing applications.
   D. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
   G. Solder Joint: ASME B16.18.

2.03 GATE VALVES
   A. Gate Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel. Gate valves shall be certified lead free.
   B. Gate Valves, 3 Inches and Larger: MSS SP-70, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with 2-piece packing gland assembly, flanged end connections; and with cast-iron handwheel. Gate valves shall be certified lead free.
   C. Gate valves shall be used only where required by code.

2.04 BALL VALVES
   A. Ball Valves, 4 Inches and Smaller: MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 or ASTM B283 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blow-out proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections, lever handle operator. Valves shall be certified lead free.

2.05 BUTTERFLY VALVES
A. Butterfly Valves: MSS SP-67, 200-psi CWP, 150-psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, wafer, lug, or grooved style, nickel-plated ductile iron, disk per application. Valves shall be certified lead free.

2.06 CHECK VALVES

A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP, horizontal swing, Y-pattern, ASTM A 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections. Valves shall be certified lead free.

B. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections. Valves shall be certified lead free.

C. Wafer Check Valves: Class 125, 200-psi CWP, ASTM A 126 cast-iron body, bronze disc/plates, stainless-steel pins and springs, Buna N seals, installed between flanges. Valves shall be certified lead free.

D. Lift Check Valves: Class 125, ASTM B 62 bronze body and cap (main components), horizontal or vertical pattern, lift-type, bronze disc or Buna N rubber disc with stainless-steel holder threaded or soldered end connections. Valves shall be certified lead free.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.02 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:
   1. Swing Check Valves: Horizontal position with hinge pin level.
   2. Wafer Check Valves: Horizontal or vertical position, between flanges.
   3. Lift Check Valve: With stem upright and plumb.

3.03 VALVE END SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
   1. Copper Tube Size, 2-1/2 Inches and Smaller: Solder ends.
   2. Copper Tube Size, 3 Inches and Larger: Solder, grooved or flanged ends.
   3. Steel Pipe Sizes, 2-1/2 Inches and Smaller: Threaded or grooved end.
   4. Steel Pipe Sizes, 3 Inches and Larger: Grooved end or flanged.

3.04 APPLICATION SCHEDULE

A. General Application:
1. Use **gate**, ball, and butterfly valves for shutoff duty.
2. Use ball and butterfly valves for throttling duty.
3. Refer to piping system Specification Sections for specific valve applications and arrangements.

B. Domestic Water Systems: Use the following valve types:
1. Gate Valves: Class 125, bronze or cast-iron body to suit piping system. Gate valves shall be used only where required by code or local utility.
2. Ball Valves: Class 150, 600-psi CWP, with stem extension.
3. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
4. Bronze Swing Check: Class 125, with rubber seat.
5. Check Valves: Class 125, swing or wafer type as indicated.

3.05 ADJUSTING
A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION
SECTION 22 0720
PIPE INSULATION FOR PLUMBING

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.03 SUBMITTALS
A. Product Data: Include product data description, list of materials, thickness, density and k-values for each product type, locations, manufacturer’s installation instructions, flames spread and smoke developed ratings.
B. See “Submittal Schedule” at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.04 QUALITY ASSURANCE
A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed Manso.
      b. Knauf FiberGlass GmbH.
      c. Owens-Corning Fiberglas Corp.
      d. Schuller International, Inc.
   2. Flexible Elastomeric Thermal Insulation:
      a. Armstrong World Industries, Inc.
      b. Rubatex Corp.

2.02 INSULATION MATERIALS
A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
   1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
      a. Nominal density is 2.5 lb/cu. Ft. or more.
      b. Thermal conductivity (k-value) at 100 deg F is 0.28 Btu x in./h x sq. ft. x deg F or less
   2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
   3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
      a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
      b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
   4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.

B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
   a. Thermal conductivity (k-value) at 90 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
   2. Adhesive: As recommended by insulation material manufacturer.
   3. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.
   1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
   2. Adhesive: As recommended by insulation material manufacturer.

E. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.
   1. Finish and Thickness: Smooth finish, 0.010 inch thick.
   2. Finish and Thickness: Corrugated finish, 0.010 inch thick.
   3. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick.
   4. Finish and Thickness: Painted finish, 0.016 inch thick.
   6. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

F. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Adhesive: As recommended by jacket material manufacturer.
   2. Color: Color as selected by Architect.
   3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.03 ACCESSORIES AND ATTACHMENTS
   A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd, 4 inch tape width.
   B. Bands: 3/4 inch wide, materials compatible with jacket:
   C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.04 VAPOR RETARDERS
   A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3: EXECUTION
3.01 EXAMINATION AND PREPARATION
   A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
   B. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS
   A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
   B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
C. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

D. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

E. Apply insulation with the least number of joints practical.

F. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

G. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

H. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

I. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

J. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Circumferential Joints: Cover with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
   3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
   4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
   5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

K. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

L. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

M. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

N. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

O. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers.

P. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07.
3.03 MINERAL-FIBER INSULATION APPLICATION
A. Apply insulation to straight pipes and tubes by securing each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
B. Apply preformed pipe insulation to outer diameter of pipe flange.
C. Apply insulation to fittings and elbows as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
   3. Cover fittings with standard PVC fitting covers.
D. Apply insulation to valves and specialties as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.04 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION
A. Apply insulation to straight pipes and tubes as follows:
   1. Follow manufacturer's written instructions for applying insulation.
   2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
B. Apply pipe insulation to outer diameter of pipe flanges.
C. Apply insulation to fittings and elbows as follows:
   1. Apply mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
D. Apply insulation to valves and specialties as follows:
   1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
   2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.05 INSTALLATION OF FIELD-APPLIED JACKETS
A. Where PVC jackets are indicated and for horizontal applications, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
B. Where aluminum jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.06 INSULATION APPLICATION SCHEDULE
A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Flexible connectors.
   2. Vibration-control devices.
   3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

B. See “Piping Insulation Schedule” on Sheet M5.01.

END OF SECTION
SECTION 22 1116
WATER DISTRIBUTION PIPING

PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

1.03 SYSTEM PERFORMANCE REQUIREMENTS
   A. Provide components and installation capable of producing piping systems with the 125 psig minimum working-pressure ratings, unless otherwise indicated:

1.04 QUALITY ASSURANCE
   A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
   B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS
   A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.02 PIPES AND TUBES
   A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
   B. Soft Copper Tube: ASTM B 88, Types K, water tube, annealed temper.
   C. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
   D. Ductile-Iron Pipe: AWWA C151, 250-psig minimum pressure rating with mechanical- or push-on-joint bell, plain spigot end, and AWWA C104 cement-mortar lining. Include AWWA C111 ductile-iron gland, rubber gasket, and steel bolts with mechanical-joint pipe. Include AWWA C111 rubber gasket with push-on-joint pipe.

2.03 PIPE AND TUBE FITTINGS
   A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
   B. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.
   C. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
   D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
   F. Ductile-Iron, Mechanical- or Push-on-Joint Fittings: AWWA C110, ductile- or gray-iron standard pattern; or AWWA C153, ductile-iron compact pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining. Include AWWA C111 ductile- or gray-iron glands, rubber gaskets, and steel bolts with mechanical-joint fittings. Include AWWA C111 rubber gaskets with push-on-joint fittings.

2.04 JOINING MATERIALS
   A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
   B. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.
   C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
E. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.
F. Mechanical Couplings for Grooved-End Copper Tubing: Copper-tube dimensions and design similar to AWWA C606, ferrous housing sections, EPDM-rubber gaskets suitable for domestic hot and cold water (gasket to serve as dielectric fitting), bolts and nuts. Minimum pressure rating = 300 psig.

2.05 VALVES
A. Refer to Division 22 Section "Valves for Plumbing" for general-duty valves.
B. Refer to Division 22 Section "Plumbing Specialties" for special-duty valves.

PART 3 - EXECUTION
3.01 PIPING APPLICATIONS
A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
B. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
C. Service Entrance Piping, Underground:
   1. 2-1/2 Inch NPS and Smaller: Soft copper tube, Type K; copper, solder-joint pressure fittings; and brazed joints.
   2. 3- to 12-Inch NPS: Ductile-iron pipe and fittings, and mechanical or push-on joints. Provide corrosion encasement of all pipe and fittings.
D. Water Distribution Piping:
   1. Aboveground (2-1/2 Inch NPS and Smaller): Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints or copper pressure-seal-joint fittings; and pressure-sealed joints.
   2. Aboveground (3-inches NPS and Larger): Hard copper tube, Type L; grooved end fittings; mechanical coupled joints [or copper pressure-seal-joint fittings; and pressure-sealed joints.
   3. Underground: Soft copper tube, Type K; wrought-copper, solder-joint pressure fittings; and soldered joints.

3.02 VALVE APPLICATIONS
A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use gate, ball, or butterfly valves.
   2. Throttling Duty: Use ball or butterfly valves.
B. Grooved-end butterfly valves may be used with grooved-end piping.

3.03 PIPING INSTALLATION, GENERAL
A. Refer to Division 23 Section "Basic Mechanical Piping Materials and Methods" for basic piping installation.
B. Install piping level without pitch or with 0.25 percent slope downward toward drain when drains are indicated.

3.04 SERVICE ENTRANCE PIPING INSTALLATION
A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building.
B. Rough-in water piping for water meter installation according to utility company's requirements. Verify water meter requirements with utility company. Provide water meters as required by utility company.
C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each service entrance pipe.
D. Install water-pressure regulators downstream from shutoff valves. Refer to Division 22 Section "Plumbing Specialties" for water-pressure regulators.
E. Ductile-Iron, Service Entrance Piping: Match Division 33 Specifications Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service pip-
ing with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.

F. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

3.05 JOINT CONSTRUCTION
A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

3.06 VALVE INSTALLATION
A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
B. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger. Gate valves shall be used only where required by code.
C. Drain Valves: Install hose-end drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
D. Calibrated Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Refer to Division 22 Section "Plumbing Specialties" for calibrated balancing valves.

3.07 FIELD QUALITY CONTROL
A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
B. Test service entrance piping and water distribution piping as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave interior piping uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved.Expose work that has been covered or concealed before it has been tested and approved.
   3. Cap and subject piping to static water pressure as required by the local Plumbing Code. If the local Plumbing Code does not stipulate testing requirements, cap and subject piping to static water pressure of 100 psig, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 15 minutes. Leaks and loss in test pressure constitute defects that must be repaired.
   4. If testing is to be performed at temperatures below freezing, an air test may be performed in lieu of water testing if allowed by local plumbing code and approved by engineer.
   5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.08 CLEANING
A. Clean and disinfect service entrance piping and water distribution piping as follows:
   1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.
c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.09 START-UP

A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Perform the following steps before putting into operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
   5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Set water-pressure regulators at 80 psig maximum outlet pressure, unless otherwise indicated.

END OF SECTION
SECTION 22 1123
DOMESTIC WATER PUMPS

PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes all-bronze and bronze-fitted centrifugal pumps for domestic cold- and hot-water circulation.

1.03 SUBMITTALS
   A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.
   B. Shop Drawings: Diagram power, signal, and control wiring.
   C. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.04 QUALITY ASSURANCE
   A. Product Options: Drawings indicate size, profiles, and dimensional requirements of domestic water pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
   B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   C. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      1. Armstrong Pumps Inc.
      2. Bell & Gossett Domestic Pump; ITT Industries.
      3. Grundfos Pumps Corp.
      4. Taco, Inc.
      5. WILO USA LLC

2.02 CLOSE COUPLED, IN-LINE, CENTRIFUGAL PUMPS
   A. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, sealless centrifugal pumps as defined in ANSI/HI 5.1-5.6.
      1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
      2. Casing: Bronze, with threaded companion-flange connections.
      3. Impeller: Corrosion-resistant material.
      4. Motor: Single speed, unless otherwise indicated.

PART 3 - EXECUTION

3.01 PUMP INSTALLATION
   A. Comply with ANSI/HI 1.4.
   B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
   C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

3.02 CONNECTIONS
   A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
   B. Install piping adjacent to pumps to allow service and maintenance.
C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or
greater than size of pump nozzles.
D. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve
on discharge side of pumps. Install valves same size as connected piping.

3.03 START UP
A. Verify that pumps are installed and connected according to the Contract Documents.
B. Perform the following preventive maintenance operations and checks before starting:
   1. Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are
      free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag,
      until cause of trouble is determined and corrected.
   2. Check suction piping connections for tightness to avoid drawing air into pumps.
   3. Clean strainers.
   4. Verify that pump controls are correct for required application.

3.04 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to
   adjust, operate, and maintain domestic water pumps.

END OF SECTION
SECTION 22 1316
DRAINAGE AND VENT PIPING

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes [sanitary drainage and vent piping][sanitary drainage, vent and storm drainage piping] inside building and to locations indicated.

1.03 SYSTEM PERFORMANCE REQUIREMENTS
A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
   2. Storm Drainage Piping: 10-foot head of water.
   3. Force-Main Piping: 100 psig.

1.04 SUBMITTALS
A. Test Results and Reports: Specified in "Field Quality Control" Article.
B. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.05 QUALITY ASSURANCE
A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
B. Comply with ASME B31.9, “Building Services Piping,” for materials, products, and installation.

1.06 FIELD CONDITIONS
A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
   1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
   2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.01 PIPES AND TUBES
A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
B. Hub-and-Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service and Extra Heavy classes. Include ASTM C 564 rubber gasket, with dimensions required for pipe class, for each hub.
C. Hubless, Cast-Iron Soil Pipe: ASTM A 888 or CISPI 301.
D. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
E. Hard Copper Tube: ASTM B 306, drainage tube, drawn temper.
F. Galvanized Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40.

2.02 PIPE AND TUBE FITTINGS
A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
C. Hub-and-Spigot, Cast-Iron, Soil-Pipe Fittings: ASTM A 74, Service and Extra Heavy classes, hub and spigot. Include ASTM C 564 rubber gasket, with dimensions required for pipe class, for each hub.
D. Hubless, Cast-Iron, Soil-Pipe Fittings: CISPI 301.
E. Copper, Solder-Joint Drainage Fittings: ASME B16.23 cast copper or ASME B16.29 wrought copper.

2.03 JOINING MATERIALS
A. Refer to Division 22 Section "Basic Piping Materials and Methods for Plumbing" for commonly used joining materials.
B. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Aboveground, [Sanitary Waste and Vent Piping][Sanitary Waste, Vent and Storm Piping]: Use the following:
   1. 1-1/2 to 10-Inch NPS: Hubless, cast-iron soil pipe; hubless, cast-iron, soil-pipe fittings; and hubless, cast-iron, soil-piping couplings.
   2. 1-1/4 to 4-Inch NPS: Hard copper drainage tube; copper, solder-joint drainage fittings; and soldered joints.

C. Underground, [Sanitary Waste and Vent Piping][Sanitary Waste, Vent and Storm Piping]: Use the following:
   1. 2- to 12-Inch NPS: Hub-and-spigot, cast-iron soil pipe, Service class; hub-and-spigot, cast-iron, soil-pipe fittings, Service class; and compression joints.
   2. 2- to 10-Inch NPS: Hubless, cast-iron soil pipe; hubless, cast-iron, soil-pipe fittings; and hubless, cast-iron, soil-piping couplings.

D. Forced Mains (piping under pressure): Use the following:
   1. Hard copper water tube, Type L; copper, solder-joint pressure fittings; and soldered joints.
   2. Galvanized steel pipe and cast-iron, threaded fittings.

3.02 PIPING INSTALLATION

A. Refer to Division 22 Section "Basic Piping Materials and Methods for Plumbing" for basic piping installation.

B. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated for service entrances into building. Install double grade cleanout and extension to grade at connections of building sanitary drains with building sanitary sewers.

C. [Extend building storm drain piping and connect to storm sewer piping in sizes and locations indicated for service entrances into building. Install double grade cleanout and extension to grade at connections of building storm drains and building storm sewers.]

D. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 22 Section "Basic Mechanical Materials and Methods for Plumbing" for wall penetration systems.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

F. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bend may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Sanitary Drain: 1/4" per foot downward in direction of flow for piping 3-inch NPS and smaller; 1/8" per foot downward in direction of flow for piping 4-inch NPS and larger.
   2. Storm Drain: 1/4" per foot downward in direction of flow.
3. Vent Piping: 1/8" per foot downward toward vertical fixture vent or toward vent stack.

  1. Compression Joints: Make with rubber gasket matching class of pipe and fittings.
  2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

J. Install indirect waste piping per local code requirements. Maintain code required air gaps.

3.03 FIELD QUALITY CONTROL

A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
  1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
  3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.

3.04 CLEANING AND PROTECTING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION
SECTION 22 1319
PLUMBING SPECIALTIES

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes plumbing specialties for the following:
   1. Water distribution systems.
   2. Soil, waste, and vent systems.
   3. Storm drainage systems.

1.03 SYSTEM PERFORMANCE REQUIREMENTS
A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
   3. Storm Drainage Piping: 10-foot head of water.

1.04 SUBMITTALS
A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
   1. Backflow preventers.
   2. Water regulators.
   5. Drain valves.
   6. Hose bibbs and hydrants.
   7. Outlet boxes.
   8. Backwater valves.
  10. Floor drains.
  11. Vent caps, vent terminals, and roof flashing assemblies.
B. Reports: Specified in "Field Quality Control" Article.
C. Maintenance Data: For specialties to include in the maintenance manuals. Include the following:
   1. Backflow preventers.
   2. Water regulators.
   3. Hose stations.
   4. Sanitary hydrants.
   5. Backwater valves.
D. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.05 QUALITY ASSURANCE
A. Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers’ products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
B. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.
C. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled as defined in National Electrical Code, Article 100.
D. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Backflow Preventers:
   a. Ames Co., Inc.
   b. B & K Industries, Inc.
   c. Cla-Val Co.
   d. CMB Industries; Febco Div.
   e. Conbraco Industries, Inc.
   f. FLOMATIC Corp.
   g. Grinnell Corp.; Mueller Co. Marketing Group for Hersey Products Div.
   h. IMI Cash Valve.
   i. Sparco, Inc.
   k. Zurn Industries, Inc.; Wilkins Div.

2. Water Pressure Regulators:
   a. Bermad, Inc.
   b. Cashco, Inc.
   c. Cla-Val Co.
   d. Conbraco Industries, Inc.
   e. FLOMATIC Corp.
   f. G A Industries, Inc.
   g. Honeywell Braukmann.
   h. IMI Cash Valve.
   i. Kaye & Mac Donald, Inc.
   k. Spence Engineering Co., Inc.
   l. Watts Industries, Inc.; Water Products Div.
   m. Zurn Industries, Inc.; Wilkins Div.

3. Calibrated Balancing Valves:
   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Flow Design, Inc.
   d. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
   e. Taco, Inc.
   f. Tour & Andersson, Inc.; Valve Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Oventrop

4. Memory-Stop Balancing Valves:
   a. Crane Co.; Valve Div.
   b. Grinnell Corp.
   c. Hammond Valve Corp.
   d. Milwaukee Valve Co., Inc.
   e. Nibco, Inc.

5. Thermostatic Water Mixing Valves:
   a. Acorn
   b. Lawler Manufacturing Co., Inc.
   c. Leonard Valve Co.
   d. Mark Controls Corp.; Powers Process Controls.
   e. Symmons Industries, Inc.
   f. T & S Brass and Bronze Works, Inc.

6. Electronic Water Mixing Valves:
   a. Acorn
   b. Armstrong
c. Thermaflo Engineering Co.
d. Powers, Watts Water Technologies Co.
e. Leonard Valve Co.

7. Water Tempering Valves:
   a. Conbraco Industries, Inc.
   b. Heat-Timer Corp.
   c. Holby Valve Co., Inc.
   d. Honeywell Braukmann.
   e. IMI Cash Valve.
   f. Leonard Valve Co.
   g. Sparco, Inc.
   h. Watts Industries, Inc.; Water Products Div.

8. Outlet Boxes:
   a. Acorn Engineering Co.
   b. Guy Gray Manufacturing Co., Inc.
   c. IPS Corp.
   d. LSP-Specialty Products Co.
   e. Oatey Co.
   f. Plastic Oddities, Inc.
   g. Symmons Industries, Inc.

9. Hydrants:
   a. Enpoco, Inc.
   b. Josam Co.
   c. Murdock, Inc.
   e. Tyler Pipe; Wade Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Woodford Manufacturing Co.
   i. Zurn Industries, Inc.; Hydromechanics Div.

10. Water Hammer Arresters:
    a. Amtrol, Inc.
    b. Enpoco, Inc.
    c. Josam Co.
    d. Precision Plumbing Products, Inc.
    e. Sioux Chief Manufacturing Co., Inc.
    g. Sparco, Inc.
    h. Tyler Pipe; Wade Div.
    i. Watts Industries, Inc.; Ancon Drain Div.
    k. Zurn Industries, Inc.; Hydromechanics Div.
    l. MIFAB, Inc.

11. Backwater Valves:
    a. Enpoco, Inc.
    b. Josam Co.
    e. Zurn Industries, Inc.; Hydromechanics Div.
    f. Enpoco, Inc.
    g. Enpoco, Inc.
    h. MIFAB, Inc.

12. Floor Drains, Roof drains, Drain Specialties
    a. Josam Co.
    b. Sioux Chief Manufacturing Co., Inc.
2.02 BACKFLOW PREVENTERS
A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
   1. 2-Inch NPS and Smaller: Bronze body with threaded ends.
   2. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
      a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.
   4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.
   5. Strainer on inlet.
B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.
C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose thread on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
D. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves with intermediate atmospheric vent.
E. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves.
F. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.
G. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head back pressure. Include 2 check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7 garden-hose thread on outlet.

2.03 WATER PRESSURE REGULATORS
A. General: water regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer.
   1. 2-Inch NPS and Smaller: Bronze body, renewable nickel alloy seats, stainless steel internal parts, with threaded ends.
   2. 2-1/2-Inch NPS and Larger: Water-control valve – pilot operated, diaphragm-type, single seated, main water-pressure control valve. Provide with low flow bypass, speed controller, specialty fittings, sensor piping and valves to isolate pilot and bypass valve trim without disrupting main building service. Cast or ductile iron body, flanged ends with initial working pressure rating of 150 psig minimum. Provide with AWWA C550 or FDA-approved, interior epoxy coating.

2.04 BALANCING VALVES
A. Calibrated Balancing Valves: Adjustable, with 2 readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
   1. 2-Inch NPS and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
   2. 2-Inch NPS and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
   3. 2-1/2-Inch NPS and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.
2.05 THERMOSTATIC WATER MIXING VALVES
A. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated.
   2. Liquid-Filled Motor, Operation and Pressure Rating: 100 psig minimum.
B. Single Fixture under counter thermostatic mixing valves. Rough chrome, thermostatic mixing valve with adjustable outlet temperature, integral check valves on both inlets, elastomer seal to prevent cross connection from hot to cold.

2.06 ELECTRONIC WATER MIXING VALVES
A. Packaged, pre-plumbed, electronic controlled mixing valve package specifically designed for use as primary water temperature controller. Provide all piping, valves, controls and accessories required for fully operating electronic mixing valve station. Alternates must be submitted and approved by engineer.
   1. Manufacturer’s standard control panel.
   2. Recirculated water control within 2°F with minimal recirculation of 2 gpm.
   3. Control of blended water from the system at a point of use within 2°F.
   4. See plans for specific flow rate requirements.
   5. Programmable temperature setpoint range.
   6. Programmable schedule operation.
   7. Automatic shut off of hot water flow upon cold water inlet supply failure.
   8. Automatic shut off of cold water flow upon hot water inlet supply failure. Automatic flow of cold water only in the event of a power failure.
   9. Maximum operating pressure 150 psi, minimum operating pressure 10 psi.
   10. Mixing valve station shall be compatible with building automation system.
   11. Mixing valve shall operate independently without interface with building automation system.

2.07 STRainers
A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated. Screwed screen retainer with centered blowdown with hose-end drain valve

2.08 HYDRANTS
A. See “Plumbing Fixture Schedule” on Sheet M5.02.

2.09 CLEANOUTS
A. Cleanout Plugs: Cast iron or brass, threads complying with ANSI B2.1, countersunk head. Engrave heads to identify system.
B. Floor Cleanouts: Cast iron body and frame with cleanout plug and adjustable round nickel bronze top. Provide to match floor system:
   1. Exposed finish type, standard mill finish.
   2. Exposed flush type, standard non-slip scored or abrasive finish.
   3. Exposed flush type, standard mill finish and carpet marker.
   4. Heavy duty for traffic applications.
C. Wall Cleanouts: Cast iron body adaptable to pipe with cast bronze, brass cleanout plug; stainless steel cover, vandal proof screws.

2.10 FLOOR DRAINS
A. See “Plumbing Fixture Schedule” on Sheet M5.02.

2.11 FLASHING
A. Floor Drains: Non-plasticized, chlorinated, polyethylene, concealed, water-proof membrane, 0.40” thick, solvent weldable. 48” square minimum.
B. Roof Drains and Vents thru Roof (VTR): 24” square minimum
1. Non-plasticized, chlorinated, polyethylene, concealed, water-proof membrane, 0.40” thick, solvent weldable.
2. Lead sheet, 2-1/2” lb/sf, concealed

2.12 MISCELLANEOUS PIPING SPECIALTIES
A. Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.
B. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F.
C. Domestic water expansion tanks: Precharged hydropneumatic expansion tank approved for potable water, with steel shell, polypropylene liner, stainless steel system connection and FDA diaphragm. Working temperature and pressure shall be 200°F and 150 psig. Tanks over 5 cubic feet capacity of 250 psi shall be ASME constructed.
D. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
E. Deep-Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.
1. 2-Inch NPS: 4-inch minimum water seal.
2. 2-1/2 Inch NPS and Larger: 5-inch minimum water seal.
F. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
G. Air-Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.
H. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
I. Vent Terminals: Commercially manufactured, shop-fabricated or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing, as indicated.

PART 3 - EXECUTION
3.01 PLUMBING SPECIALTY INSTALLATION
A. General: Install plumbing specialty components, connections, and devices according to manufacturer’s written instructions.
B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.
C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.
D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.
E. [Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.]
F. [Install backwater valves in building drain piping as required to prevent sewer backup. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.]
G. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:
1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.
5. Install wall cleanout at the beginning of an above ground horizontal waste line which serves multiple water closets.

H. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
I. Install cleanout wall access covers with frame and cover flush with finished wall, for cleanouts located in concealed piping.
J. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
K. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer’s written instructions.
L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
M. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.
N. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
O. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
P. Position floor drains for easy access and maintenance.
Q. Install roof drains at low points of roof areas according to roof membrane manufacturer’s written installation instructions. Size outlets as indicated.
R. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
S. Position roof drains for easy access and maintenance.
T. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
U. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install water-supply stop valves in accessible locations.
V. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
W. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.
X. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
Y. Install water hammer arrestor at each battery of plumbing fixture connections and additionally as required to eliminate water hammer. Locate per manufacturer’s recommendations or Standard PDI-WH 201. Locate in easily accessible location for future maintenance.
Z. Install flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

3.02 CONNECTIONS
A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 26 Sections.
C. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.
D. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.03 START-UP
A. Before startup, perform the following checks:
   1. System tests are complete.
   2. Damaged and defective specialties and accessories have been replaced or repaired.
   3. Clear space is provided for servicing specialties.
B. Before operating systems, perform the following steps:
   1. Close drain valves, hydrants, and hose bibs.
   2. Open general-duty valves to fully open position.
   3. Remove and clean strainers.
   4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.
C. Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, energize circuits for electrically operated units. Start and run units through complete sequence of operations.
D. Adjust operation and correct deficiencies discovered during commissioning.

3.04 PROTECTION
A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.05 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain, plumbing specialties.

END OF SECTION
SECTION 22 3300
DOMESTIC WATER HEATERS

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following electric water heaters:
   1. Instantaneous electric water heaters.
   2. Light-commercial electric water heaters.
   3. Compression tanks.

1.03 SUBMITTALS
A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
B. Shop Drawings: Diagram power, signal, and control wiring.
C. Operation and Maintenance Data: For electric water heaters to include in operation and maintenance manuals.
D. Warranty: Special warranty specified in this Section.
E. See “Submittal Schedule” at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.04 QUALITY ASSURANCE
A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section “Product Requirements.”
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.
F. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

1.05 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:
      b. Electric Water Heaters:
         1) Storage Tank: Three years.
         2) Controls and Other Components: One year.
      c. Compression Tanks: One year.
PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS
   A. Description: Comply with UL 174 for household, storage electric water heaters.
      1. Manufacturers:
         c. Electric Heater Company (The); Hubbell Heaters Division.
         d. GSW Water Heating Company.
         e. Heat Transfer Products, Inc.
         f. Lochinvar Corporation.
         i. Smith, A. O. Water Products Company.
         j. State Industries, Inc.
      2. Storage-Tank Construction: Steel, vertical arrangement.
         b. Pressure Rating: 150 psig.
         c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
      3. Factory-Installed Storage-Tank Appurtenances:
         a. Anode Rod: Replaceable magnesium.
         b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
         c. Drain Valve: ASSE 1005.
         d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
         e. Jacket: Steel with enameled finish.
         f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
         g. Heating Elements: Screw-in immersion type; wired for simultaneous or non-simultaneous operation as indicated on drawings.
         h. Temperature Control: Adjustable thermostat for each element.
         i. Safety Control: High-temperature-limit cutoff device or system.
         j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.03 COMPRESSION TANKS
   A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
      1. Manufacturers:
         a. AMTROL Inc.
         b. Armstrong Pumps, Inc.
         c. Flexcon Industries.
         d. Honeywell Sparco.
         e. Myers, F. E.; Pentair Pump Group (The).
         f. Smith, A. O.; Aqua-Air Div.
         g. State Industries, Inc.
         h. Taco, Inc.
         i. Watts Regulator Co.
         j. Wessels Co.
      2. Construction:
         a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

c. Air-Charging Valve: Factory installed.

2.04 WATER HEATER ACCESSORIES
A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Water Heater Stand and Drain-Pan Units: High-density-polyethylene-plastic, 18-inch- high, enclosed-base stand complying with IAPMO PS 103 and IAS No. 2. Include integral or separate drain pan with raised edge and NPS 1 drain outlet with ASME B1.20.1 pipe thread.

C. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

D. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

E. Condensate Neutralization Kit.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION
A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

C. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

D. Fill water heaters with water.

E. Charge compression tanks with air.

3.02 CONNECTIONS
A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.

D. Make connections with dielectric fittings where piping is made of dissimilar metal.

3.03 FIELD QUALITY CONTROL
A. Perform startup service per manufacturer's recommendations.

B. In addition to manufacturer's written installation and startup checks, perform the following:
   1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   2. Verify that piping system tests are complete.
   3. Check for piping connection leaks.
   4. Check for clear relief valve inlets, outlets, and drain piping.
   5. Test operation of safety controls, relief valves, and devices.
   6. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.

3.04 DEMONSTRATION
A. Train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

   1. Train Owner's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.

   2. Review data in maintenance manuals.
3. Schedule training with Owner, through Architect, with at least seven days’ advance notice.

END OF SECTION
SECTION 22 4000
PLUMBING FIXTURES

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes plumbing fixtures and trim, faucets, other fittings, and related components.

1.03 DEFINITIONS
A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

1.04 SUBMITTALS
A. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
B. [Wiring diagrams from manufacturer for electrically operated units.]
C. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals.
D. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.05 QUALITY ASSURANCE
C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.06 EXTRA MATERIALS
A. Repair kits complete with all necessary washers, springs, pins, retainers, packings, O-rings, sleeves and seats: Furnish quantity of identical units not less than 5 percent of each type and size installed.

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Vitreous-China and Enameled Fixtures:
      a. Kohler Co.
      b. American Standard, Inc.
      c. Briggs Industries, Inc.
      d. ProFlo (Manufactured by Briggs, supplied by Ferguson)
      e. Crane Plumbing.
      f. Eljer Industries.
      g. Gerber Plumbing Fixtures Corp.
      h. Mansfield Plumbing Products, Inc.
      i. Universal-Rundle Corp.
      j. Sloan Valve Co.
   2. Flushometer Valves:
      a. Sloan Valve Co
      b. Coyne & Delany Co.
      c. Speakman Co.
      d. TOTO KIKI USA, Inc.
3. Toilet Seats:
   a. American Standard, Inc.
   c. Centoco Manufacturing Corp.
   d. Church Seat Co.
   e. Eljer Industries.
   f. Kohler Co.
   g. Olsonite Corp.
   h. Sanderson Plumbing Products, Inc.; Beneke Industries, Ltd.
   i. Sperzel.

4. Supply Fittings and Faucets:
   a. American Standard, Inc.
   b. Chicago Faucet Co.
   c. Crane Plumbing.
   d. Eljer Industries.
   e. Kohler Co.
   g. Masco Corp.; Delta Faucet Co.
   h. Moen, Inc.
   i. Price Pfister, Inc.
   j. Speakman Co.
   k. Symmons Industries, Inc.
   l. T & S Brass and Bronze Works, Inc.
   m. Zurn Industries, Inc.

5. Stainless-Steel Sinks:
   a. Elkay Manufacturing Co.
   b. Just Manufacturing Co.
   c. Kohler Co.
   d. Moen, Inc.

6. Fitting Insulation Kit:
   a. Brocar Products, Inc.
   b. Engineered Brass Co.
   c. McGuire Manufacturing Co., Inc.
   d. Plumberex Specialty Products.
   e. TCI Products.
   f. TRUEBRO, Inc.

7. Mop Sinks:
   a. Fiat Products, Inc.
   b. Stern-Williams Co., Inc.
   c. Aqua Glass Corp.
   d. Mustee: E.L. Mustee & Sons, Inc.

8. Electric Water Coolers / Drinking Fountains
   a. EBCO Manufacturing Co.
   b. Elkay Manufacturing Co.
   c. Halsey Taylor.
   d. Haws Drinking Faucet Co.
   e. Murdock
   f. Sunroc Corp.
   g. Oasis
   h.

9. Fixture Carriers
   a. J. R. Smith
   b. Josam
   c. Zurn
2.02 FITTINGS
A. Fittings for Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for materials for supplies, supply stops, supply risers, traps, and other fittings.
1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
2. Supply Stops: Chrome-plated brass, angle or straight; compression, 1/4 turn ball stop valve, wheel-handle or loose-key type; same size as supply inlet and with outlet matching supply riser. Brass ball with PTFE seat. Rated for 40-deg F to 180-deg F and 125 psi maximum.
4. Traps: Tubular brass with 0.045-inch wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.
5. Continuous Waste: Tubular brass, 0.045-inch wall thickness, with slip-joint inlet, and size to match equipment.
6. Indirect Waste: Tubular brass, 0.045-inch wall thickness, and size to match equipment.

PART 3 - EXECUTION
3.01 EXAMINATION
A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

3.02 APPLICATIONS
A. Include supports for plumbing fixtures according to the following:
1. Carriers: For wall-hanging water closets and fixtures supported from wall construction.
2. Chair Carriers: For wall-hanging urinals, lavatories, sinks, drinking fountains, and electric water coolers.
3. Heavy-Duty Chair Carriers: For accessible urinals, lavatories, and other fixtures where indicated.
B. Include fitting insulation kits for accessible fixtures according to the following:
1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
3. Other Fixtures: Cover exposed fittings below fixture.

3.03 PLUMBING FIXTURE INSTALLATION
A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.
B. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.
C. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.
D. Install wall hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.
E. Install toilet seats on water closets.
F. Install wall hanging, back-outlet urinals with gasket seals.
G. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.
H. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
I. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
J. Fasten recessed, wall-mounted fittings to reinforcement built into walls.
K. Fasten wall-mounted fittings to reinforcement built into walls.
L. Fasten counter-mounting plumbing fixtures to casework.
M. Secure supplies to supports or substrate within pipe space behind fixture.
N. Set shower receptors and mop sink basins in leveling bed of cement grout.
O. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.
  1. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.
P. Install water supply stop valves in accessible locations.
Q. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
R. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
S. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.
T. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
U. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.
V. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.
W. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.04 CONNECTIONS
A. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture. Install hot- and cold-water-supply, waste and vent piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

3.05 FIELD QUALITY CONTROL
A. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
B. Inspect installed fixtures for damage. Replace damaged fixtures and components.
C. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.06 ADJUSTING AND CLEANING
A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
B. Adjust water pressure at faucets and flushometer valves having controls, to produce proper flow and stream.
C. Replace washers and seals of leaking and dripping faucets and stops.
D. Clean fixtures, faucets, and other fittings with manufacturers’ recommended cleaning methods and materials.

3.07 PROTECTION
A. Provide protective covering for installed fixtures and fittings.
B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.08 PLUMBING FIXTURE SCHEDULE
A. See Sheet m5.02.

END OF SECTION
HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY
   A. This Section includes general mechanical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of heating, ventilation, and air conditioning (HVAC) systems.

1.03 WARRANTIES
   A. All materials, workmanship and equipment shall be warranted against defects or against injury from proper and usual wear for a period of one year after the date of substantial completion. Any item which becomes defective within the warranty period shall be repaired or replaced, at no additional cost to the Owner.
   B. All manufacturer’s warranties shall run to the benefit of the Owner. No manufacturer’s warranties shall be voided or impaired.
   C. Warranty shall include repair of faulty workmanship.

1.04 ALTERNATES
   A. Alternates, if required, shall be as described in the “Alternates” section of this specification, as described on the proposal form of as indicated on the drawings.

1.05 INTERPRETATION OF DOCUMENTS
   A. Any questions regarding the meaning of any portion of the contract documents shall be submitted to the Architect/Engineer for interpretation. Definitive interpretations or clarification will be published by addenda or supplemental information. Verbal interpretation not issued by addendum or supplemental information shall not be considered part of the contract documents.
   B. The Architect/Engineer shall be the sole judge of interpretations of discrepancies within the contract documents.
   C. If ambiguities should appear in the contract documents, the Contractor shall request clarification from the Architect/Engineer before proceeding with the work. If the Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out the work in a manner satisfactory to the Architect/Engineer. Should a conflict occur within the contract documents, the Contractor is deemed to have estimated the more expensive way of doing the work unless a written clarification from the Architect/Engineer was requested and obtained before submission of proposed methods or materials.

1.06 DEFINITIONS ABBREVIATIONS
   A. The following shall apply throughout the contract documents
     1. Code       All applicable national state and local codes
     2. Furnish    Supply and deliver to site ready for installation
     3. Indicated  Noted, scheduled or specified
     4. Provide     Furnish, install and connect complete and ready for final use by owner
     5. ADA        Americans with Disabilities Act
     6. ANSI       American National Standards Institute
     7. ARI        Air-Conditioning and Refrigeration Institute
     8. ASHRAE     American Society of Heating, Refrigerating and Air-Conditioning Engineers
     9. ASME       American Society of Mechanical Engineers
    10. ASTM       American Society for Testing and Materials
    11. NEC        National Electric Code (NFPA 70)
    12. NEMA       National Electrical Manufacturers Association
    13. NFPA       National Fire Protection Association
    14. SMACNA     Sheet Metal and Air Conditioning Contractors’ National Association
    15. UL         Underwriters Laboratories Inc.

1.07 CODES AND STANDARDS
A. All work shall be performed by competent craftsmen skilled in the trade involved and shall be done in a manner consistent with normal industry standards.

B. All work shall conform to the currently adopted edition of the National Electric Code (NEC), International Building Code with Omaha amendments, International Mechanical Code with Omaha amendments, Omaha Plumbing Code, International Energy Code with Omaha amendments, and all other applicable state and local codes or standards.

C. Where there is a conflict between the code and the contract documents, the code shall have precedence only then it is more stringent than the contract documents. Items that are allowed by the code but are less stringent than those specified shall not be substituted.

1.08 PERMITS

A. Contractor shall become familiar and comply with all requirements regarding permits, fees, licenses, etc. All permits, licenses, inspections and arrangements required for the work shall be obtained by Contractor’s effort and expense. All utilities shall be installed in accordance with the local rules and regulations and all charges shall be paid by the Contractor.

1.09 SUBMITTALS

A. Division 1 section “Submittals” shall be adhered to if more stringent than this section.

B. Shop drawings shall be submitted to Architect/Engineer for review when required by other sections of this specification and for all equipment scheduled or specified on drawings.

1. A letter of transmittal shall be accompany each submittal. Submittals shall be numbered consecutively and list products covered.

2. Unless otherwise noted, submit an electronic copy of shop drawing and product data for review. Submit one (1) sample of each item required.

C. Shop Drawings

1. Shop drawings include fabrication and installation drawings, diagrams, schedules of other data specifically prepared for the project. Include dimensions and notations showing compliance with specified standards.

2. Drawing sheet size shall be at least 8½” x 11” and not larger than 30”x42”. For sheets larger than 11”x17”, submit one sheet of reproducible media and one blue-line or photocopy print. Architect/Engineer action will be returned on reproducible media.

D. Product Data

1. Product data includes printed information, such as manufacture’s installation instructions, catalog cuts, standard color charts, rough-in diagrams, wiring diagrams and performance curves.

2. Each copy shall clearly indicate conformance with specified capacities, characteristics, dimensions and details. Mark all equipment with same item number as used on drawings. Mark each copy to clearly indicate applicable choices and options.

E. Samples

1. Samples are physical examples used to illustrate materials, equipment or workmanship

F. Architect/Engineer will review or take appropriate action for submittals. Review is only to determine general conformance with design shown in contract documents.

G. Architect/Engineer review of submittals shall not relieve contractor of responsibility for deviation from requirements of the contract documents or from errors or omissions within submittals.

H. No portion of the work requiring submittals shall be commenced until the Architect/Engineer has reviewed the submittal.

I. Electronic Floor Plan Drawings in AutoCAD 2013 format may be requested for use in preparation of shop drawings. Morrissey Engineering reserves the right to reject requests for electronic drawings. Electronic files shall be prepayed at $50/sheet. Submit written request to Morrissey Engineering or email request to info@morrisseyengineering.com. Indicate the project name, and floor plan sheets requested. The use of these drawings is intended solely for preparation of drawings required by this specification. Copyright law prohibits any other use. The user of the electronic files assumes full responsibility for the accuracy and scale of the drawings.

J. See “Submittal Schedule” at the end of Section 23 0100 – General Requirements for HVAC.

1.10 OPERATION AND MAINTENANCE MANUALS
A. Assemble (3) complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
   1. Operation Data:
      a. Emergency instructions and procedures.
      b. System, subsystem, and equipment descriptions, including operating standards.
      c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
      d. Description of controls and sequence of operations.
      e. Piping and wiring diagrams.
   2. Maintenance Data:
      a. Manufacturer's information, including list of spare parts.
      b. Name, address, and telephone number of installer or supplier.
      c. Maintenance procedures.
      d. Maintenance and service schedules for preventive and routine maintenance.
      e. Maintenance record forms.
      f. Sources of spare parts and maintenance materials.
      g. Copies of maintenance service agreements.
      h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.11 PROJECT RECORD DOCUMENTS
A. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally.
   2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
   3. Mark important additional information that was either shown schematically or omitted from original Drawings.
   4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
   5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

PART 2 - PRODUCTS
2.01 MATERIALS
A. All materials and equipment used in the construction of the project shall be new unused and undamaged unless otherwise specified. Materials and equipment shall be of latest design standards of manufacturer specified.
B. Materials and equipment are limited by the requirements of the contract documents. Material and equipment shall be provided in accordance with the following:
   1. Basis of Design Products: Basis of Design Products are those products around which the project was designed in terms of capacity, performance, physical size and quality. Basis of Design Products shall be provided unless substitutions are made in accordance with this specification.
2. **Substitutions:** Substitutions are product of manufacturers other than listed as Basis of Design. Substitutions shall meet each of the following requirements:
   a. The product shall be manufactured by one of the acceptable manufacturers listed in the contract documents.
   b. The product shall meet or exceed the requirements of the contract documents in terms of quality, performance, suitability, appearance and characteristics.
   c. The contractor providing the substitution shall bear the total cost of all changes due to substitutions. These may include but are not limited to redesign costs and increased work by other contractors or the owner.
   d. The Architect/Engineer shall be the sole judge of the suitability of the substitution items.

C. Verify installation details and requirements for materials and equipment furnished by others and installed under this contract.

**PART 3 - EXECUTION**

**3.01 DEMONSTRATION AND TRAINING**

A. **Instruction:** Instruct Owner’s personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner and Architect/Engineer with at least seven days’ advance notice.

B. **Program Structure.** Include instruction for the following:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.
   5. Troubleshooting.
   7. Safety.

**3.02 STARTING AND ADJUSTING**

A. Start and test all equipment and operating components to confirm proper operation. Test and adjust all systems to achieve designed capacity and performance.

B. Provide three (3) copies of all test report to the Architect/Engineer for review prior to date of substantial completion.

C. All equipment and systems discrepancies shall be corrected prior to final acceptance.
**MECHANICAL SUBMITTAL SCHEDULE**
Refer to individual specification sections for additional requirements and detail on each submittal.

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<td>Propeller Unit Heaters</td>
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</table>
END OF SECTION
PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following basic mechanical materials and methods and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of mechanical systems.
   1. Indenting Devices and Labels
   2. Grout
   3. Sealants
   4. Access Doors
   5. Electrical Requirements
   6. Motors
   7. Mechanical Equipment Installation
   8. Labeling and Identifying
   9. Demolition
   10. Work in Existing Buildings
   11. Construction Layout
   12. Data and Measurements

1.03 DEFINITIONS
A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.04 SUBMITTALS
A. Product Data: For sealants and identification materials and devices.
B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
C. See “Submittal Schedule” at the end of Section 23 0100 – General Requirements for HVAC.

1.05 QUALITY ASSURANCE
A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Each contractor shall make provisions for delivery and safe storage of materials. Materials shall be delivered in a timely manner to expedite the work.
B. Protect stored piping, supplies and equipment from cold, moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
1.07 COORDINATION
A. Coordinate mechanical equipment installation with other building components.
B. Arrange for pipe, duct and equipment spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.
G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.
H. Painting:
   1. The General Contractor is to field paint exposed mechanical equipment, ductwork, piping and related materials in specified areas as noted on the mechanical plans, mechanical schedules and in the specifications. The Division 21, 22, and 23 Contractors are responsible to coordinate the painting of these items with the General Contractor. The Division 21, 22, and 23 Contractors are to provide materials in these areas that are suitable for accepting paint. The cleaning and preparation of the materials to reach paint is the responsibility of the General Contractor unless noted specifically to be responsibility of the Division 23 Contractor.
   2. In concealed locations, field-fabricated bare iron or steel items required for installation of work under this Division shall have rough or sharp edges removed and shall be painted with one coat of zinc rich paint.
   3. In exposed locations, field-fabricated bare iron or steel items required for installation of work under this Division shall have rough or sharp edges removed and shall be painted in accordance with architectural sections.
I. Motors, equipment, controls, etc. shall be furnished, mounted and connected according to the following schedule unless otherwise noted (E =Electrical Contractor, H = HVAC Contractor):

<table>
<thead>
<tr>
<th>Item</th>
<th>Furnished By</th>
<th>Set in place or mounted by</th>
<th>Power wiring and connection by</th>
<th>Control Wiring and connection by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Equipment Motors</td>
<td>H</td>
<td>H</td>
<td>E</td>
<td>H</td>
</tr>
<tr>
<td>2) Magnetic Motor Starters:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Automatically controlled, with or without HOA switches.</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>H</td>
</tr>
<tr>
<td>b) Automatically controlled, with or without HOA switches and furnished as part of factory-wired mechanical equipment</td>
<td>H</td>
<td>H</td>
<td>E</td>
<td>H</td>
</tr>
<tr>
<td>c) Manually controlled</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>---</td>
</tr>
<tr>
<td>d) Manually controlled and furnished as part of factory-wired mechanical equipment</td>
<td>H</td>
<td>H</td>
<td>E</td>
<td>---</td>
</tr>
<tr>
<td>3) Disconnect switches, thermal overload switches, manual operating switches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Furnished as part of factory wired mechanical equipment</td>
<td>H</td>
<td>H</td>
<td>E</td>
<td>---</td>
</tr>
</tbody>
</table>
b) Loose mounted

4) Transformers
   a) Serving 120 Volt and higher loads
   b) Serving 24 Volt control power

5) Contactors

6) Push-button stations, pilot lights

7) Line voltage thermostats and time clocks.

8) Low voltage controls and thermostats

9) Motorized valves, and float controls for tanks and sumps

10) Motorized control valves, damper motors, solenoid valves, etc.
    a) Line Voltage
    b) Low Voltage

11) Factory pre-wired control/power panels including remote sensing devices

12) Electric wall and unit heaters

13) Fire protection controls

14) Fire Smoke Dampers
    a) At air handling unit (24 Volt)
    b) In space (120 Volt)

15) Fire and smoke detectors including relays for fan shutdown

16) Engine generator
    a) Generator muffler
    b) Generator controls
    c) Generator damper controls
    d) All other fluids

K. Notes:
   1. When control power is not available, mechanical contractor shall provide control transformers as required to power all valves, dampers, etc.
   2. Conduit rough-in for thermostats by electrical contractor where indicated on plans.
   3. Remote condensing units and heat pumps control wiring including wiring of remote sensors by mechanical. Control circuit feeders by mechanical unless shown otherwise.
   4. Smoke dampers will be specified as 115 volt (verify) with wiring by Electrical Contractor and control from the fire alarm panel. Smoke detectors furnished by electrical contractor are required to make dampers operate.
   5. Wiring from alarm contacts to alarm system by Electrical; control function wiring by Mechanical.
   6. Engine supplier provided.

PART 2 - PRODUCTS

2.01 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer’s standard products of categories and types required for each application as referenced in other Division 23 Sections. If more than one type is specified for application, selection is Installer’s option, but provide one selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
   2. Location: Accessible and visible location.
C. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
   1. Fabricate in sizes required for message.
   2. Engraved with engraver’s standard letter style, of sizes and with wording to match equipment identification.

D. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

E. Valve Tags: 19 gauge, 1-1/2” diameter, polished brass, stamped or engraved ¼” high piping system abbreviation in and ½” high sequenced valve numbers.
   1. Valve tag fastener: solid brass wire link or beaded chain, or ‘S’-hook or size required for proper attachment of tags to valves.


H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

2.02 GROUT
   A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
      2. Design Mix: 5000-psig, 28-day compressive strength.

2.03 SEALANTS
   A. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging for application in vertical and horizontal joints. Color as selected by architect.
   B. Accessories: Primer, joint cleaner, joint backing and bond breaker as recommended by sealant manufacturer to suit application.
   C. Firestopping Materials: Provide firestopping material to maintain required rating of all fire-resistive assemblies according to requirements of “Firestopping” section of this specification.

2.04 ACCESS DOORS
   A. Prime Coated 14 gauge steel, flush, with screw driver operated cam lock. Frame to accommodate construction type; size as indicated.

2.05 ELECTRICAL REQUIREMENTS
   A. Compliance for HVAC Equipment
      1. Comply with applicable requirements of the National Electric Code (NFPA 70)
      2. Provide equipment and accessories that are listed and labeled as defined in NFPA 70
      3. Comply with applicable requirements of Underwriters Laboratory (UL)
      4. Comply with applicable requirements of NEMA standards
   B. Electrical Wire
      1. Wiring material shall be in accordance with the latest version of the National Electric Code (NFPA 70) and all applicable local codes and carry the UL label where applicable.
      2. All exposed wiring in return air plenums shall be rate cable for fire and smoke spread.

2.06 PAINT PRODUCTS
   A. Material Compatibility:
      1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
      2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
   B. Colors: As selected by Owner from manufacturer’s full range.
C. Primer: Surface-Tolerant Metal Primer: Corrosion-resistant, solvent-based metal primer formulated for use on steel pipe and metal fabrications that have been minimally prepared.

D. Finish: Interior, Latex, Institutional Low Odor/VOC, Flat: White or colored latex paint with low-odor characteristics and a VOC of less than 10 grams per liter, for use in occupied buildings, where the odor and VOC levels of conventional latex products would preclude their use. Gloss and Sheen Level in manufacturer's standard flat finish in color selected by Owner.

2.07 MOTORS

A. BASIC MOTOR REQUIREMENTS
1. Motors ¾ HP and Larger shall be polyphase. Motors Smaller than ¾ HP shall be single phase unless otherwise indicated.
2. Frequency Rating shall be 60 Hz. Voltage Rating is determined by voltage of circuit to which motor is connected.
3. Service Factor: According to NEMA MG 1, unless otherwise indicated.
4. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
5. Enclosure: Open dripproof, unless otherwise indicated.

B. POLYPHASE MOTORS
1. General
   b. Stator: Copper windings, unless otherwise indicated. Multispeed motors have separate winding for each speed.
   c. Rotor: Squirrel cage, unless otherwise indicated.
   d. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
   e. Temperature Rise: Match insulation rating, unless otherwise indicated.
   f. Insulation: Class F, unless otherwise indicated.
2. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for indicated controller, with required motor leads brought to motor terminal box to suit control method.
3. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer. Inverter rated motors used in conjunction with variable speed drives shall be equipped with a shaft grounding ring. Grounding ring shall be Helwig Carbon Bearing Protector, installed per manufacturer requirements. Grounding ring may be epoxy mounted if manufacturer's recommended epoxy adhesive is used.
4. Rugged-Duty Motors: Where indicated, motors are totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings are insulated with nonhygroscopic material. External finish is chemical-resistant paint over corrosion-resistant primer.

C. SINGLE-PHASE MOTORS
1. Permanen-split capacitor, Split-phase start, capacitor run or capacitor start, capacitor run as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application.
2. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
3. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.

D. ELECTRONICALLY COMMUTATED MOTORS (ECM)
1. Permanent magnet type motor with near-zero rotor losses designed for synchronous rotation.
2. Brushless DC motor controlled by an integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator as indicated or selected by manufacturer, to suit starting torque and other requirements of specific motor application. Coordinate input signal for speed with specific application.
3. Motor shall be designed to maintain a minimum 70 percent efficiency over the entire operating range.
4. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
5. Bearings: Sealed, prelubricated ball bearing type for poly-phase or single-phase motors.

PART 3 - EXECUTION
3.01 EQUIPMENT INSTALLATION
A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
E. Install equipment giving right of way to piping installed at required slope.

3.02 POSITION OF DEVICES
A. Devices shall be installed at the height indicated below unless otherwise noted. All heights of outlets are measured from finished floor to centerline of device. Locate devices mounted on finish surfaces with regards to furring, trim, etc. Heights may be adjusted as necessary to clear wall mounted cabinets, electrical devices, etc. Where installed in masonry walls, mounting heights may be adjusted to correspond to block courses. In no case shall devices requiring wheelchair accessibility be mounted above 48”.
   1. Thermostats (where located adjacent to light switches, match light switch height) 44”
   2. Space Sensors (without set point adjustment) 44”
   3. Temperature Control Panels (not requiring occupant interface) 60”

3.03 LABELING AND IDENTIFYING
A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
   2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior non-concealed locations:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
      c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
      d. At access doors, manholes, and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
      g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.

C. Valve Tags:
   1. Install valve tag at all valves in piping systems listed below
      a. Heat Pump Loop piping
      b. Chilled water piping
      c. Heating water piping
      d. Condenser water piping
   2. Provide reproducible set of drawings indicating all valve locations.

D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.04 FIRESTOPPING
   A. Apply firestopping to all duct and pipe penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.05 CONCRETE BASES
   A. Construct concrete bases of dimensions indicated, but not less than 3-1/2” inches larger in both directions than supported unit. Follow supported equipment manufacturer’s setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement.

3.06 DEMOLITION
   A. Disconnect, demolish, and remove Work specified in Division 23 Sections.
   B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
   C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
   D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.
   E. Removal: Remove indicated equipment from Project site.
   F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.07 WORK IN EXISTING BUILDINGS
   A. Full Owner Occupancy: The Owner will occupy the site and existing building during the construction period. Cooperate with the Owner to minimize conflicts with the Owner’s operations.
   B. Schedule all work in advance with the owner. Do not proceed with work without the Owner’s written approval.
   C. Notify Owner of noisy operations and schedule in advance.
   D. The Owner shall have the right to direct work to secure safe and proper progress and quality of work.
   E. Do not interrupt utilities without Owner’s written approval of time and duration. Interruptions shall be minimum required for completion of work.
   F. The Owner shall be notified before starting welding or cutting. Fire extinguishers shall be immediately accessible when welding or cutting with an open flame or arc. Welding or cutting with an open flame or arc shall be stopped not less than one hour before leaving the premises.
   G. Existing mechanical items that interfere with the proper installation new work shall be removed or relocated as required or as directed by the Architect/Engineer.

3.08 CUTTING AND PATCHING
   A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for installations. Perform cutting by skilled mechanics of trades involved.
   B. Repair cut surfaces to match adjacent surfaces.

3.09 CONSTRUCTION LAYOUT
   A. Layout work in advance of installation using data and measurements from the site, the appropriate architectural and structural drawings and shop drawings.
   B. Confirm adequate clearance for installation, operation, maintenance and code required clearance including items installed by other contractors.
C. If layout to provide clearance is not possible, promptly notify Architect/Engineer for clarification.

3.10 DATA AND MEASUREMENTS
   A. The data given herein and on the drawings is as accurate as could be secured. The existence and location of construction as indicated is not guaranteed. Before beginning work investigate and verify the existence and location of items affecting work. Obtain exact locations, measurements, levels, etc., at the site and adapt work to actual conditions.
   B. Only [Architectural drawings, Structural drawings, and] site measurements may be utilized in calculations. Mechanical and electrical drawings are diagrammatic or schematic.

3.11 PAINTING AND FINISHING
   A. Refer to individual sections for paint materials, surface preparation, and application of paint.
   B. Do not paint piping specialties with factory-applied finish.
   C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.12 ERECTION SUPPORTS AND ANCHORAGE
   A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
   B. Field Welding: Comply with applicable codes and standards.

3.13 GROUTING
   A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix and place and cure grout according to manufacturer's written instructions.

3.14 ACCESS
   A. Provide access to all equipment, valves, controls, etc. as required for operation, repair and maintenance.
   B. Access doors shall be provided when access through ceilings, chases, etc. is not provided by others.

3.15 ELECTRICAL WIRING
   A. Install all electrical wiring in accordance with the National Electric Code and Division 26 of this specification.
   B. All line voltage [and low voltage] wire shall be installed in metal raceways.
   C. All low voltage wire in [equipment rooms] [concealed in walls] or [exposed in space] shall be installed in metal raceways.

END OF SECTION
SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives.

1.03 DEFINITIONS
   A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
   B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
   C. [Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.]
   D. [Suction Head: The height of fluid surface above the centerline of the pump on the suction side.]
   E. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
   F. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

1.04 SUBMITTALS
   A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
   B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
   C. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.
   D. See Submittal Schedule located at the end of Section 23 0100 "General Requirements for Mechanical Systems."

1.05 QUALITY ASSURANCE
   A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.
   B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel.
   C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
      1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
      2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
D. Testing, Adjusting, and Balancing Reports: Use testing, adjusting, and balancing Agent's standard forms approved by the Architect/Engineer.
E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB standards.
F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS
A. Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.07 COORDINATION
A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
B. Perform testing, adjusting, and balancing after leakage and pressure tests on [air] and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
B. Examine approved submittal data of HVAC systems and equipment.
C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
G. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
H. Examine terminal units, such as variable-air-volume boxes and fan powered boxes, to verify that they are accessible and their controls are connected and functioning.
I. Examine strainers for clean screens and proper perforations.
J. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.
K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
L. Examine automatic temperature system components to verify proper operation.
M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 GENERAL TESTING AND BALANCING PROCEDURES
A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.03 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES
A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
B. Prepare schematic diagrams of systems' "as-built" duct layouts.
C. [For variable-air-volume systems, develop a plan to simulate diversity.]
D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
E. Check dampers for proper position to achieve desired airflow path.
F. Check for airflow blockages.
G. Check condensate drains for proper connections and functioning.

3.04 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES
A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
   2. Measure static pressure across each air-handling unit component.
   3. Adjust fan speed higher or lower than design with the approval of the Architect/Engineer. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes. Do not make fan-speed adjustments that result in motor overload.
B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
C. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

3.05 VARIABLE-AIR-VOLUME SYSTEMS' ADDITIONAL PROCEDURES
A. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
   1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
   2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge duct losses.
   3. Measure total system airflow. Adjust to within 10 percent of design airflow.
   4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use the terminal unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
   5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
   6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure adequate static pressure is maintained at the most critical unit.
8. Record the final fan performance data.

3.06 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS
A. Prepare schematic diagrams of systems' "as-built" piping layouts.
B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
   1. Open all manual valves for maximum flow.
   2. Check expansion tank liquid level.
   3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
   4. Check flow-control valves for specified sequence of operation and set at design flow.
   5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
   6. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.07 HYDRONIC SYSTEMS' BALANCING PROCEDURES
A. Determine water flow at pumps. Use the following procedures.
   1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.
   2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.
   3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
B. Set calibrated balancing valves, if installed, at calculated presettings.
C. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures.
D. Measure the differential-pressure control valve settings existing at the conclusions of balancing.
E. Balance systems with automatic 2- and 3-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.
F. [Primary-Secondary Systems: Balance the primary system crossover flow first, then balance the secondary system.]

3.08 TEMPERATURE TESTING
A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
B. Measure indoor wet- and dry-bulb temperatures. Measure when the building or zone is occupied.
C. Measure outside-air, wet- and dry-bulb temperatures.

3.09 TOLERANCES
A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: minus 10 to plus 10 percent.
   2. Air Outlets and Inlets: minus 10 to plus 10 percent.
   3. [Water Flow Rate: minus 5 to plus 5 percent.]

3.10 FINAL REPORT
A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
C. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents.
11. Notes to explain why certain final data in the body of reports vary from design values.
12. Test conditions for fans and pump performance forms.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems.

E. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches, and bore.
   i. Sheave dimensions, center-to-center and amount of adjustments in inches.
   j. Number of belts, make, and size.
   k. Number of filters, type, and size.
2. Motor Data: Include the following:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Sheave dimensions, center-to-center and amount of adjustments in inches.
3. Test Data: Include design and actual values for the following:
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Filter static-pressure differential in inches wg.
   f. Preheat coil static-pressure differential in inches wg.
   g. Cooling coil static-pressure differential in inches wg.
   h. Heating coil static-pressure differential in inches wg.
   i. Outside airflow in cfm.
   j. Return airflow in cfm.
   k. Outside-air damper position.
   l. Return-air damper position.
   m. Variable frequency drive setting.

F. Apparatus-Coil Test Reports: For apparatus coils, include the following:
1. Coil Data: Include the following:
   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data: Include design and actual values for the following:
   a. Airflow rate in cfm.
   b. Air pressure drop in inches wg.
   c. Water flow rate in gpm.
   d. Water pressure differential in feet of head or psig.

G. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
   1. Unit Data: Include the following:
      a. System identification.
      b. Location.
      c. Coil identification.
      d. Capacity in Btuh.
      e. Number of stages.
      f. Connected volts, phase, and hertz.
      g. Rated amperage.
      h. Airflow rate in cfm.
      i. Face area in sq. ft..
      j. Minimum face velocity in fpm.
   2. Test Data: Include design and actual values for the following:
      a. Airflow rate in cfm.
      b. Voltage at each connection.
      c. Amperage for each phase.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:
   1. Fan Data: Include the following:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer's serial number.
      f. Arrangement and class.
      g. Sheave make, size in inches, and bore.
      h. Sheave dimensions, center-to-center and amount of adjustments in inches.
   2. Motor Data: Include the following:
      a. Make and frame type and size.
      b. Horsepower and rpm.
      c. Volts, phase, and hertz.
      d. Full-load amperage and service factor.
      e. Sheave make, size in inches, and bore.
      f. Sheave dimensions, center-to-center and amount of adjustments in inches.
      g. Number of belts, make, and size.
   3. Test Data: Include design and actual values for the following:
      a. Total airflow rate in cfm.
      b. Total system static pressure in inches wg.
      c. Fan rpm.
      d. Discharge static pressure in inches wg.
      e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
   1. Report Data: Include the following:
      a. System and air-handling unit number.
      b. Location and zone.
c. Duct static pressure in inches wg.
d. Duct size in inches.
e. Duct area in sq. ft..
f. Design airflow rate in cfm.
g. Design velocity in fpm.
h. Actual airflow rate in cfm.
i. Actual average velocity in fpm.
j. Barometric pressure in psig.

J. Air-Terminal-Device Reports: For terminal units, include the following:
1. Unit Data: Include the following:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Test apparatus used.
   d. Area served.
   e. Air-terminal-device make.
   f. Air-terminal-device number from system diagram.
   g. Air-terminal-device type and model number.
   h. Air-terminal-device size.
   i. Air-terminal-device effective area in sq. ft..
2. Test Data: Include design and actual values for the following:
   a. Airflow rate in cfm.
   b. Air velocity in fpm.

K. Air Outlet Reports:
1. Air outlet data
   a. Make and type.
   b. Model number and size.
2. Test data: Include design and actual data for the following:
   a. Airflow rate in cfm.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data: Include the following:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Room or riser served.
   d. Coil make and size.
   e. Flowmeter type.
2. Test Data: Include design and actual values for the following:
   a. Airflow rate in cfm.
   b. Air pressure drop in inches wg.
   c. Water pressure drop in feet of head or psig.

M. Packaged Chiller Reports: For each chiller, include the following:
1. Unit Data: Include the following:
   a. Unit identification.
   b. Make and model number.
   c. Manufacturer's serial number.
   d. Refrigerant type and capacity in gal..
   e. Starter type and size.
   f. Starter thermal protection size.
2. Test Data: Include design and actual values for the following:
   a. Evaporator water pressure differential in feet of head or psig.
   b. Evaporator water flow in gpm.
   c. Condenser pressure differential in feet of head or psig.
   d. Condenser water flow in gpm.

N. Heat-Exchanger/Converter Test Reports: For steam and hot-water heat exchangers, include the following:
1. Unit Data: Include the following:
a. Unit identification.
b. Location.
c. Service.
d. Make and type.
e. Model and serial numbers.
f. Ratings.

2. Steam Test Data: Include design and actual values for the following:
   a. Inlet pressure in psig.
   b. Condensate flow rate in lb/h.

3. Primary Water Test Data: Include design and actual values for the following:
   a. Entering-water temperature in deg F.
   b. Leaving-water temperature in deg F.
   c. Entering-water pressure in feet of head or psig.
   d. Water pressure differential in feet of head or psig.
   e. Water flow rate in gpm.

4. Secondary Water Test Data: Include design and actual values for the following:
   a. Entering-water temperature in deg F.
   b. Leaving-water temperature in deg F.
   c. Entering-water pressure in feet of head or psig.
   d. Water pressure differential in feet of head or psig.
   e. Water flow rate in gpm.

O. Pump Test Reports: For pumps, include the following data. Calculate impeller size by plotting the shutoff head on pump curves.
   1. Unit Data: Include the following:
      a. Unit identification.
      b. Location.
      c. Service.
      d. Make and size.
      e. Model and serial numbers.
      f. Water flow rate in gpm.
      g. Water pressure differential in feet of head or psig.
      h. Required net positive suction head in feet of head or psig.
      i. Pump rpm.
      j. Impeller diameter in inches.
      k. Motor make and frame size.
      l. Motor horsepower and rpm.
      m. Voltage at each connection.
      n. Amperage for each phase.
      o. Full-load amperage and service factor.
      p. Seal type.
   2. Test Data: Include design and actual values for the following:
      a. Static head in feet of head or psig.
      b. Pump shutoff pressure in feet of head or psig.
      c. Actual impeller size in inches.
      d. Full open flow rate in gpm.
      e. Full-open pressure in feet of head or psig.
      f. Final discharge pressure in feet of head or psig.
      g. Final suction pressure in feet of head or psig.
      h. Final total pressure in feet of head or psig.
      i. Final water flow rate in gpm.
      j. Voltage at each connection.
      k. Amperage for each phase.

P. Instrument Calibration Reports: For instrument calibration, include the following:
   1. Report Data: Include the following:
      a. Instrument type and make.
      b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION
SECTION 23 0700
DUCT INSULATION

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes semi-rigid and flexible duct insulation; acoustical duct liner, accessories and attachments; and sealing compounds.

1.03 SUBMITTALS
A. Product Data: Include product data description, list of materials, thickness, density, k-values and r-values for each product type, locations, manufacturer’s installation instructions, flames spread and smoke developed ratings.
B. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for HVAC.”

1.04 QUALITY ASSURANCE
A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Insulation:
      a. CertainTeed
      b. Armaflex
      c. Rubatex
      d. Knauf
      e. Owens-Corning
      f. Halstead
      g. Armstrong
      h. Manville
      i. Pittsburgh Corning

2.02 INSULATION MATERIALS
A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type I, 0.75 pcf density, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
B. Acoustical duct liner: ASTM C 518 with resin and black mat coated surface exposed to air stream to prevent erosion of glass fibers. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature. Nominal Density 1.5 lbs per cubic foot, minimum noise reduction characteristic shall be 0.55 for 1" thickness; rated for 6000 fpm air velocity; air friction multiplier less than 1.6 at 2000 fpm.

2.03 ACCESSORIES AND ATTACHMENTS
A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd..
B. Bands: 3/4 inch wide, materials compatible with jacket:
C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.04 VAPOR RETARDERS
A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION
3.01 EXAMINATION AND PREPARATION
A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application. Proceed with installation only after unsatisfactory conditions have been corrected.
B. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 MINERAL-FIBER BLANKET INSULATION APPLICATION
A. Apply insulation materials, accessories, and finishes according to the manufacturer’s written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
C. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
D. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
E. Apply insulation with the least number of joints practical.
F. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
G. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
H. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
   3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
I. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.
J. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

K. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

L. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

M. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

N. Secure insulation with adhesive and anchor pins and speed washers.

3.03 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

B. Butt transverse joints without gaps and coat joint with adhesive.

C. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

D. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

E. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

F. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall.

G. Ductwork sizes indicated on drawings are the free area size. Ductwork sizes shall be increased to accommodate the addition of liner to maintain the plan indicated free area size.

3.04 DUCT AND PLENUM APPLICATION SCHEDULE

A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Fibrous-glass ducts.
   2. Factory-insulated flexible ducts.
   3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
   4. Flexible connectors.
   5. Vibration-control devices.
   6. Testing agency labels and stamps.
   7. Nameplates and data plates.
   8. Access panels and doors in air-distribution systems.

B. Service: EXHAUST AIR, from louver or hood back 36" into building.
   2. Minimum R-Value: R6
   3. Vapor Retarder Required: Yes.

END OF SECTION
SECTION 23 0720
PIPE INSULATION FOR HVAC

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; [field-applied jackets:] accessories and attachments; and sealing compounds.

1.03 SUBMITTALS
A. Product Data: Include product data description, list of materials, thickness, density, k-values and r-values for each product type, locations, manufacturer’s installation instructions, flames spread and smoke developed ratings.
B. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for HVAC”

1.04 QUALITY ASSURANCE
A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed Manso.
      b. Knauf FiberGlass GmbH.
      c. Owens-Corning Fiberglas Corp.
      d. Schuller International, Inc.
      e. Johns Manville
   2. Flexible Elastomeric Thermal Insulation:
      a. Armacell
      b. Armstrong World Industries, Inc.
      c. Rubatex Corp.

2.02 INSULATION MATERIALS
A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
   1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
      a. Nominal density is 2.5 lb/cu. Ft. or more.
      b. Thermal conductivity (k-value) at 125 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
   2. Military Specification referenced below is the only standard now available. Mil-A-3316C was last updated in October 1989.
   3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
      a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
      b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.

B. High Temperature Mineral Fiber Insulation: ANSI/ASTM C547; maximum k value of .24 at 150°F; minimum density of approximately 6 lbs. per cubic foot; temperature range +35°F to 1200°F jacket: All Service Jacket (ASJ); 0.010 inch embossed aluminum cover.

C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
1. Thermal conductivity (k-value) at 90 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less
2. Adhesive: As recommended by insulation material manufacturer.
3. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

D. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

E. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.
1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

F. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.
1. Finish and Thickness: Smooth finish, 0.020 inch thick.
2. Finish and Thickness: Painted finish, 0.016 inch thick.
4. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

G. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Adhesive: As recommended by jacket material manufacturer.
2. Color: Color as selected by Architect.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.03 ACCESSORIES AND ATTACHMENTS
A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd, 4 inch tape width.
B. Bands: 3/4 inch wide, materials compatible with jacket.
C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.04 VAPOR RETARDERS
A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION
3.01 EXAMINATION AND PREPARATION
A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
B. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS
A. Apply insulation materials, accessories, and finishes according to the manufacturer’s written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

D. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

E. Apply insulation with the least number of joints practical.

F. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

G. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
   3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

H. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

I. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

J. Apply adhesives and mastics at the manufacturer’s recommended coverage rate.

K. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Circumferential Joints: Cover with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
   3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
   4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
   5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

L. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

M. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

N. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

O. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

P. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Division 07 for firestopping and fire-resistant joint sealers.

Q. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies.

3.03 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes buy securing each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.

B. Apply preformed pipe insulation to outer diameter of pipe flange.

C. Apply insulation to fittings and elbows as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
   3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:
   1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
   2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.04 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:
   1. Follow manufacturer's written instructions for applying insulation.
   2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply pipe insulation to outer diameter of pipe flanges.

C. Apply insulation to fittings and elbows as follows:
   1. Apply mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation inserts at hangers and anchor locations.
   1. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

E. Apply insulation to valves and specialties as follows:
   1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.

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2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.05 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where PVC jackets are indicated and for horizontal applications, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
B. Where aluminum jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.06 INSULATION APPLICATION SCHEDULE

A. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Flexible connectors.
   2. Vibration-control devices.
   3. Chrome-plated pipes and fittings, unless potential for personnel injury.
   4. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.
B. See “PIPING INSULATION SCHEDULE” on Sheet M5.01]
C. Service: Condensate drain piping (CD).
   1. Insulation Material: Mineral fiber.
   2. Insulation Thickness: Apply the following insulation thicknesses:
      a. PVC piping: None
      b. Copper: 1/2"
   3. Vapor Retarder Required: Yes.
D. Service: Refrigerant suction (RS).
   1. Insulation Material: Flexible elastomeric
   2. Insulation Thickness: 1-1/2"
   3. Vapor Retarder Required: Yes.
   4. Finish: Two coats of manufacturer’s coating when exposed to outside.
E. Service: Refrigerant liquid (RL).
   1. Insulation Material: Flexible elastomeric
   2. Insulation Thickness: 1-1/2"
   3. Vapor Retarder Required: Yes.
   4. Finish: Two coats of manufacturer's coating when exposed to outside.

END OF SECTION
SECTION 23 3113
METAL DUCTS AND ACCESSORIES

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. This Section includes metal ducts and accessories for heating, ventilating, and air-conditioning systems, diffusers, registers and grilles, and gas vents.

1.03 DEFINITIONS
   A. Pressure Classification for Ductwork: As defined by to SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” and applicable codes.
      1. Low Pressure: Maximum 2500 fpm velocity; maximum 2.0" WG positive or -2.0" WG negative static pressure class.

1.04 SUBMITTALS
   A. Product data including product construction, installation instructions and performance data for the following:
      1. Sealing materials.
      2. Backdraft dampers.
      4. Remote damper operators.
      5. Fire and smoke dampers.
      6. Duct-mounted access doors and panels.
      7. Flexible ducts
      8. Double Wall Insulated Ductwork
      9. Diffusers, Registers & Grilles
     10. Louvers
     11. Gas Vents
     12. Hangers and Supports
   B. No requirement for shop drawings if after examining the contract documents and actual conditions, contractor agrees system can be installed as shown.
   C. Shop Drawings: Show details of the following:
      1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
      2. Duct layout indicating pressure classifications and sizes on plans.
      3. Fittings.
      4. Reinforcement and spacing.
      5. Seam and joint construction.
      6. Penetrations through fire-rated and other partitions.
      7. Terminal unit, coil, and humidifier installations.
      8. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.
   D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
   E. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.
   F. See “Submittal Schedule” located at the end of Section 23 0100 “General Requirements for HVAC.”

1.05 QUALITY ASSURANCE

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Backdraft and Volume Dampers
   a. Greenheck
   b. Air Balance
   c. American Warming
   d. Cesco
   e. Louvers and Dampers, Inc.
   f. Penn
   g. Prefco
   h. Carnes
   i. Ruskin
   j. Vent Products
2. Remote Manual Damper Operators
   a. Young Regulator
   b. Metalaire
   c. United Enertech
   d. Ruskin
3. Remote Electronic Damper Operators
   a. Young Regulator
   b. Metalaire
   c. United Enertech
   d. Ruskin
   e. Greenheck
4. Automatic Balancing Damper
   a. Greenheck
5. Fire and Smoke Dampers
   a. Greenheck
   b. Air Balance
   c. American Warming
   d. Cesco
   e. Louvers and Dampers, Inc.
   f. Penn
   g. Pottorff
   h. Prefco
   i. Carnes
   j. Ruskin
   k. Vent Products
   l. Nailor Industries
6. Flexible Ducts
   a. Flexible Air Products
   b. Flexmaster
   c. Thermaflex
   d. Certainteed
   e. Wiremold
   f. General Flex Corp
   g. H.K. Porter
7. Duct Access Doors
   a. Air Balance
   b. American Warming
   c. Cesco
   d. Ventfrabrics
   e. Penn
   f. Prefco
   g. Carnes
   h. Ruskin
8. Diffusers, Registers, Grilles
   a. Carnes
   b. J & J Register
   c. Krueger
   d. Reliable
   e. Price
   f. Tuttle and Bailey
   g. Metal-Aire
   h. Titus
   i. Hart and Cooly
   j. Anemostat
   k. Nailor Industries

9. Louvers
   a. American Warming
   b. Dowco
   c. Louvers and Dampers, Inc.
   d. Airline
   e. Greenheck
   f. Ruskin
   g. Aerolite
   h. Vent Products
   i. Arrow
   j. Reliable
   k. Pottorf

10. Duct Hangers & Supports:
    a. Ductmate Industries, Inc.
    b. Duro Dyne
    c. Eberl Iron Works, Inc.
    d. Gripple
    e. Miro Industries, Inc.
    f. The Pate Company
    g. PHP Systems / Design

11. Manufactured Underground Ductwork
    a. AQC Industries, LLC. (Blue Duct) or approved equal. (Product substitutions must be
        approved in writing by the Engineer).

2.02 SHEET METAL MATERIALS
   A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation;
      mill-phosphatized finish for surfaces of ducts exposed to view.
   B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galva-
      nized, sheet metal ducts.
   C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch
      minimum diameter for lengths longer than 36 inches.

2.03 SEALANT MATERIALS
   A. Duct Sealant: UL classified, non-combustible, flame spread 25 or less, smoke developed rating
      of 540 or less, resistant to water, pressure rupture rating of 16″ WG minimum, suitable for use
      alone or with tape, application an operational temperature ranges appropriate for usage.

2.04 MANUFACTURED DUCT JOINTS
   A. Manufactured duct joining system to consist of roll formed angles, corner pieces, metal
      cleats and gasket material. Construct and join ductwork in accordance with the latest SMACNA
      test data and joint reinforcement schedule corresponding to duct gauge used. Corners to be
      down set design, no bolt design except bolting is required for medium pressure applications.
2.05 BACKDRAFT DAMPERS
A. Dampers to be multi-blade, parallel action, counter-balanced backdraft dampers of galvanized steel or extruded aluminum, with center pivoted blades linked together with blade edge seals, brass or steel bearings, and plated steel pivot pin.

2.06 MANUAL-VOLUME DAMPERS
A. Fabricate in accordance with latest edition of SMACNA HVAC Duct Construction Standards – Metal and Flexible and as indicated.
B. Fabricate single blade dampers for duct sizes 9 ½: high x 30” width maximum. Single blade dampers to have spring end bearing regulator. Provide end brace for static pressure greater than 2.0” WG. Provide end brace for static pressure greater than 2.0”.
C. Fabricate multi-blade damper of opposed blade pattern using minimum 16 gauge steel with maximum blade sizes 6” x 48”. Where width exceeds 48”, provide regulator at both ends. Assemble center and edge crimped blades in 16 gauge channel frame with suitable hardware. Blades and frame to be galvanized or prime coated steel except where indicated for special application.
D. Provide end bearings with end seals for pressure class required except in round duct 12” in diameter and smaller.
E. Provide with locking quadrant actuator unless scheduled for remote actuation.

2.07 REMOTE DAMPER OPERATORS
A. Description: Cable system designed for remote manual damper adjustment.
1. Tubing: [Brass] [Copper] [Aluminum].
2. Cable: [Stainless steel] [Steel].
3. Remote adjusting device shall be either wall or diffuser/register mounted for adjustment.
4. Wall-Box Mounting: [Recessed] [Surface].
5. Wall-Box Cover-Plate Material: [Steel] [Stainless steel]
B. Description: Electronic actuated system designed for remote electronic damper adjustment.
1. Factory installed 9-volt DC operated damper motor for remote adjustment.
2. Operator shall include a factory wired plenum rated RJ11 connector for field wiring connection.
3. Remote controller shall be 9-volt battery operated device either wall or diffuser/register mounted for adjustment.
5. Wall-Box Mounting: [Recessed] [Surface].
6. Wall-Box Cover-Plate Material: [Steel] [Stainless steel]
7. Basis of design: Ruskin model ZPD25 or equal.

2.08 AUTOMATIC BALANCING DAMPER
A. Description: Self-contained balancing damper responding automatically to duct pressure changes to maintain airflow without a power supply.
1. General: Labeled to UL 2043
2. Construction: Frame and blades constructed of reinforced UL 94 thermoplastic resin. Bearings shall be hydraulic blade damper for control. Damper springs to be stainless steel.
3. Damper shall be suitable for pressures up to 2 in. wg with airflow up to 275 CFM and temperature range of 25 degrees F to 150 degrees F.
4. Damper shall include a hand operated manual setpoint adjuster for field calibration without special tools. All setpoints shall be within +/- 10% of airflow adjustment. Setpoints shall be factory calibrated and tested in accordance with AMCA 500-D-12
5. Accessories: When scheduled provide following accessories, duct transition (ABD-T), grille with mounting box (ABD-GM), and UL listed fire damper assembly (ABD-FD).
6. Basis of design: Greenheck model ABD

2.09 TURNING VANES
A. Fabricate to comply with SMACNA’s "HVAC Duct Construction Standards--Metal and Flexible."
B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches on center; and set into side strips suitable for mounting in ducts.

2.10 DUCT-MOUNTED ACCESS DOORS AND PANELS
A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.
F. Label: Label access doors at fire and smoke damper locations per NFPA 90A.

2.11 FLEXIBLE CONNECTORS
A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
B. Neoprene double-coated woven glass fiber fabric in accordance with NFPA 90A, suitable for temperatures and pressures of application, approximately 6" wide, crimped into metal edge strip.

2.12 FLEXIBLE DUCTS
A. General: Comply with UL 181, Class 1.
B. Factory-fabricated, insulated, round duct, with an outer jacket enclosing glass-fiber insulation around a continuous inner liner.
   1. Reinforcement: Steel-wire helix encapsulated in inner liner.
   2. Outer Jacket: Polyethylene film or Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
   3. Inner Liner: Polyethylene film.
C. Pressure Rating: 4-inch wg positive, 3/4-inch wg negative.

2.13 DIFFUSER, REGISTERS AND GRILLES
A. General: Sizes, types and capacities as indicated. Verify ceiling and wall frame types and dimensions from architectural drawings. Factory baked enamel finish with color selected by Architect unless otherwise indicated.
B. Diffusers: Circular, square, or rectangular air distribution outlet comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air. Opposed blade dampers.
C. Grilles: Streamlined blades, single or double deflection as indicated.
D. Registers: Combination grille and opposed damper assembly.

2.14 LOUVERS
A. Non-FEMA rated louvers shall be Ruskin ELF375DX (or approved equal), extruded aluminum; 4" deep frame, drainable and storm-proof blade configuration, 0.081" frame and 0.081" nominal wall thickness blades, 3 ½" blade spacing, 50% minimum free area based on 48"x 48" louver size; ¾" aluminum mesh birdscreen. Finish baked enamel, color selected by architect.

2.15 ACCESSORY HARDWARE
A. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.16 HANGERS AND SUPPORTS
A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
C. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

D. Strap and Rod Sizes: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Ducts."

E. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

F. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

G. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

H. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

I. Trapeze and Riser Supports:

PART 3 - EXECUTION

3.01 DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA’s "HVAC Duct Construction Standards-Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

B. Low Pressure duct
   1. Seams and Joints (Rectangular Ducts): Longitudinal seams shall be Pittsburg lock, grooved seams or button punch snap lock. Transverse joints shall be drive slip. Joints 36" and larger shall be manufactured duct joining system with downset corners, or SMACNA T-25 formed on flanges with corner and cleat. Contractor option on smaller sizes
   2. Seams and Joints (Concealed Round Duct): Transverse joints in low velocity concealed round ducts shall be slip type secured with sheet metal screws equally spaced on 6" centers maximum with a minimum of three screws per joint. Joints shall be sealed with mastic during joining. Exposed inside edge of duct at joint shall point in direction of airflow. All duct joints exposed to weather shall be caulked weathertight.
   3. Seams and joints (Exposed Round Duct): Longitudinal seams shall be lock type spiral or grooved seams rolled spirally. Transverse joints shall be slip type up to 36" in diameter and shall be sealed with mastic during joining. Flanged and gasketed joints shall be used on size larger than 36" diameter.

C. Rectangular fittings: Construct tees, bends and elbows with centerline radius of 1-1/2 times width of duct.

D. Round Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

E. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to low pressure standards the following:
   1. General Exhaust Ducts: Low Pressure

F. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

G. Sizes shown on plans are inside clear dimensions. Ductwork utilizing duct liner shall be increased in size to accommodate the duct liner thickness.

3.02 DUCT INSTALLATION

A. Drawings indicate general arrangement of ducts, fittings, and accessories. Minor modifications to route, size and shape of duct may be required to meet structural and other interference. Changes which could affect system performance shall be reviewed by Architect/Engineer prior to fabrication or installation of duct.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
E. Install couplings tight to duct wall surface with a minimum of projections into duct.
F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and fire-stopping sealant. Contractor shall be responsible to coordinate appropriately rated fire damper with supplier and engineer. All fire dampers shall be dynamically rated unless otherwise approved by Engineer and Authority Having Jurisdiction.
N. Roof penetrations by ducts should have curbs. Ducts that are interrupted at the curb should overhang the top of the curb or be flashed to divert water over the curb. Ducts that are continuous through the curb should have flashing that slopes over the curb ad is sealed to the duct with caulking or suitable tape.

3.03 HANGER AND SUPPORT INSTALLATION
A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.
C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
D. Hangers Exposed to View: Threaded rod and angle or channel supports.
E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
G. Ductwork mounted on roof or otherwise exposed to elements shall be supported with frames constructed of galvanized steel angles and channels, regardless of duct size. All fasteners should be galvanized. Supports should elevate ductwork above finished roof level by a minimum of 18 inches.

3.04 PROTECTION OF DUCTWORK ON SITE
A. Ductwork stored on site as well as installed ductwork that is left open to construction activities shall be covered. Provide protective coverings on open ends of ductwork to prevent excessive
accumulation of dust and debris on interior surfaces. Protection and storage of ductwork shall be in accordance to SMACNA's "Duct Cleanliness for New Construction".

3.05 SEAM AND JOINT SEALING
   A. Low Pressure Ductwork: Seal per SMACNA Seal Class "C". Sealant material shall be installed per manufacturer's recommendations.
   B. Seal externally insulated ducts before insulation installation.

3.06 HANGING AND SUPPORTING
   A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
   B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
   C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

3.07 DUCT ACCESSORY INSTALLATION
   A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
   B. Install volume dampers at locations indicated and at all branch take-offs to air outlets and inlets.
   C. Provide fire and smoke dampers at locations indicated and where required by applicable codes. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
   D. Provide turning vanes in all mitered elbows and duct turns.
   E. Install duct access panels for access to inlet side of coils, equipment, control dampers, fire dampers, and smoke dampers.
   F. Final connections to air outlets and terminal units may be made with flexible duct. Install flexible ducts with metal collars or sleeves with draw bands. Length of flexible duct shall not exceed 36", path shall not exceed 0°.
   G. Provide flexible connections to motor driven equipment. Secure fabric to duct or fan collar with 3/16" rivets space not more than 5" on center. Provide thrust restraints so that connections are not in tension with equipment in operation.
   H. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
   I. Install gas vents, chimneys, and stacks according to manufacturer's written instructions and NFPA 54. Locate to comply with minimum clearances from combustibles.

3.08 FIELD QUALITY CONTROL (DUCT LEAKAGE TESTS)
   A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.
   B. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
   C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.
   D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.
   E. Remake leaking joints and retest until leakage is less than maximum allowable.
   F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.09 ADJUSTING
   A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for detailed procedures.
   B. Adjust duct accessories for proper settings and actions.
3.10 CLEANING
   A. After completing system installation, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.
   B. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION
SECTION 23 3423
POWER VENTILATORS

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following:
   1. In-line centrifugal fans.

1.03 SUBMITTALS
A. Product Data: For each type of product include the following:
   1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
   2. Rated capacities, operating characteristics, and furnished specialties and accessories.
   3. Certified fan performance curves with system operating conditions indicated.
   4. Certified fan sound-power ratings.
   5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   6. Material gages and finishes, including color charts.
   7. Dampers, including housings, linkages, and operators.
   8. Fan speed controllers.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
C. Maintenance Data: For power ventilators to include in operation and maintenance manuals.
D. See “Submittal Schedule” at the end of Section 23 0100 “General Requirements for Mechanical Systems.”

1.04 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
D. UL Standard: Power ventilators shall comply with UL 705.

1.05 COORDINATION
A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.06 EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. In-Line Centrifugal Fans:
      b. Carnes Company HVAC.
      c. Cook, Loren Company.
      d. Greenheck Fan Corp.
      e. ILG Industries, Inc./American Coolair Corp.
      f. Penn Ventilation Companies, Inc.
      g. York.
2.02 IN-LINE CENTRIFUGAL FANS
A. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
C. Direct Drive Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.
D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
E. Accessories:
   1. Companion Flanges: For inlet and outlet duct connections.
   2. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   3. See Schedule for additional accessories.

2.03 MOTORS
A. Comply with requirements in Division 23 Section "Basic Mechanical Materials and Methods."
B. Enclosure Type: Guarded dripproof.

2.04 SOURCE QUALITY CONTROL
A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION
3.01 INSTALLATION
A. Install power ventilators level and plumb.
B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware.
C. Ceiling Units: Suspend units from structure; use vibration isolating hangers.
D. Support suspended units from structure using threaded steel rods and vibration isolators.
E. Install units with clearances for service and maintenance.

3.02 CONNECTIONS
A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
B. Install ducts adjacent to power ventilators to allow service and maintenance.
C. Connect wiring according to Division 26.
D. Ground equipment according to Division 26.
E. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1. Install control and electrical power to field-mounted control devices.

3.03 FIELD QUALITY CONTROL
A. Equipment Startup Checks:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Verify lubrication for bearings and other moving parts.
   6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
   7. Disable automatic temperature-control operators.
B. Starting Procedures:
   1. Energize motor and adjust fan to indicated rpm.
   2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

F. Replace fan and motor pulleys as required to achieve design airflow.

G. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.04 ADJUSTING
   A. Adjust damper linkages for proper damper operation.
   B. Adjust belt tension.
   C. Lubricate bearings.

3.05 CLEANING
   A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
   B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.06 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.
      1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
      2. Review data in maintenance manuals.
      3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION
SECTION 23 8126
SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed mounting.

1.03 SUBMITTALS
A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
B. Shop Drawings: Diagram power, signal, and control wiring.
C. [Samples for Initial Selection: For units with factory-applied color finishes.]
D. Field quality-control test reports.
E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
F. Warranty: Special warranty specified in this Section.
G. See “Submittal Schedule” located at the end of Section 23 “General Requirements for HVAC”.

1.04 QUALITY ASSURANCE
A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
B. ASHRAE Compliance:
   1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
   2. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
E. [Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.”]

1.05 COORDINATION
A. [Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 03 3000 “Cast-in-Place Concrete.”]
B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.]

1.06 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period:
      a. Compressors: Five years from date of Substantial Completion.
      b. All other components: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Daikin Applied
3. Lennox Industries Inc.
4. LG Corporation
5. Midea
6. Mitsubishi
7. Sanyo
8. York International Corp.
9. Samsung

2.02 EVAPORATOR-FAN COMPONENTS
A. Wall Mounted Cabinet: Plastic with removable panels on front and ends in manufacturer’s standard and discharge drain pans with drain connection.
B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
D. Fan Motors: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.
E. Washable Filters: 1 inch thick, in metal frames.
F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS
A. Casing: Steel, finished with baked enamel in manufacturer’s standard color, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
   1. Compressor Type: Scroll.
   2. Inverter compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
   3. Refrigerant Charge: R-410
C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
E. Fan: Aluminum-propeller type, directly connected to motor.
F. Motor: Permanently lubricated, with integral thermal-overload protection.
G. Low Ambient Kit: Permits cooling and heating operation down to -20°F.

2.04 ACCESSORIES
A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
   1. Compressor time delay.
   2. 24-hour time control of system stop and start.
   3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
   4. Fan-speed selection, including auto setting.
C. Automatic-reset timer to prevent rapid cycling of compressor.
D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION
3.01 INSTALLATION
A. Install units level and plumb.
B. Install evaporator-fan components using manufacturer’s standard mounting devices securely fastened to building structure.
C. [Install ground-mounting, compressor-condenser components on 4-inch-thick, reinforced concrete base; 4 inches larger on each side than unit.]
D. [Install roof-mounted compressor-condenser components per detail on plan.]
E. Install refrigerant piping per manufacturer's recommendations. Install piping to allow access to unit.

3.02 CONNECTIONS
A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Install piping adjacent to unit to allow service and maintenance.

3.03 STARTUP SERVICE
A. Engage a factory-authorized service representative to perform startup service. Complete installation and startup checks according to manufacturer's written instructions.

3.04 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Sections.

END OF SECTION
ELECTRICAL
SECTION 26 0100
GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY
   A. This Section includes general electrical requirements and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of electrical systems.

1.03 WARRANTIES
   A. All materials, workmanship and equipment shall be warranted against defects or against injury from proper and usual wear for a period of one year after the date of substantial completion. Certain equipment shall be warranted beginning at the time of final acceptance or for longer periods of time as specified in those sections of the Project Manual. Any item which becomes defective within the warranty period shall be repaired or replaced, at no additional cost to the Owner.
   B. All manufactures warranties shall run to the benefit of the Owner. No manufacturer’s warranties shall be voided or impaired.
   C. Warranty shall include repair of faulty workmanship.

1.04 ALTERNATES
   A. Alternates, if required, shall be as described in the “Alternates” section of this specification, as described on the proposal form or as indicated on the drawings.

1.05 INTERPRETATION OF DOCUMENTS
   A. Any questions regarding the meaning of any portion of the contract documents shall be submitted to the Architect/Engineer for interpretation. Addenda or supplemental information will publish definitive interpretations or clarification. Verbal interpretation not issued by addendum or supplemental information shall not be considered part of the contract documents.
   B. The Architect/Engineer shall be the sole judge of interpretations of discrepancies within the contract documents.
   C. If ambiguities should appear in the contract documents, the Contractor shall request clarification from the Architect/Engineer before proceeding with the work. If the Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out the work in a manner satisfactory to the Architect/Engineer. Should a conflict occur within the contract documents, the Contractor is deemed to have estimated the more expensive way of doing the work unless a written clarification from the Architect/Engineer was requested and obtained before submission of proposed methods or materials.

1.06 DEFINITIONS ABBREVIATIONS
   A. The following shall apply throughout the contract documents
   1. Code All applicable national state and local codes
   2. Furnish Supply and deliver to site ready for installation
   3. Indicated Noted, scheduled or specified
   4. Provide Furnish, install and connect complete and ready for final use by Owner
   5. ADA Americans with Disabilities Act
   6. ANSI American National Standards Institute
   7. ASTM American Society for Testing and Materials
   8. FM Factory Mutual System
   9. IRI HSB Industrial Risk Insurers
   10. NEC National Electric Code (NFPA 70)
   11. NEMA National Electrical Manufacturers Association
   12. NFPA National Fire Protection Association
   13. UL Underwriters Laboratories Inc.

1.07 CODES AND STANDARDS
A. All work shall be performed by competent craftsmen skilled in the trade involved and shall be done in a manner consistent with normal industry standards.

B. All work shall conform to the currently adopted edition of the National Electric Code (NEC), Local Building Code, and all other applicable state and local codes or standards.

C. Where there is a conflict between the code and the contract documents, the code shall have precedence only when it is more stringent than the contract documents. Items that are allowed by the code but are less stringent than those specified shall not be substituted.

1.08 PERMITS
A. Contractor shall become familiar and comply with all requirements regarding permits, fees, licenses, etc. All permits, licenses, inspections and arrangements required for the work shall be obtained by Contractor’s effort and expense. All utilities shall be installed in accordance with the local rules and regulations and all charges shall be paid by the Contractor. Capital facilities fees will be paid by Owner.

1.09 SUBMITTALS
A. Division 1 section “Submittals” shall be adhered to if more stringent than this section.

B. Shop drawings shall be submitted to Architect/Engineer for review when required by other sections of this specification and for all equipment scheduled or specified on drawings.
   1. A letter of transmittal shall accompany each submittal. Submittals shall be numbered consecutively and list products covered.
   2. Unless otherwise noted, submit a minimum of six (6) copies of shop drawing and product data for review.

C. Shop Drawings
   1. Shop drawings include fabrication and installation drawings, diagrams, schedules of other data specifically prepared for the project. Include dimensions and notations showing compliance with specified standards.
   2. Drawing sheet size shall be at least 8½” x 11” and no longer than 30” x 42”. For sheets larger than 11” x 17”, submit one sheet of reproducible media and one blue-line or photocopy print. Architect/Engineer action will be returned on reproducible media.

D. Product Data
   1. Product data includes printed information, such as manufacturer’s installation instructions, catalog cuts, standard color charts, rough-in diagrams, wiring diagrams and performance curves.
   2. Each copy shall clearly indicate conformance with specified capacities, characteristics, dimensions and details. Mark all equipment with same item number as used on drawings. Mark each copy to clearly indicate applicable choices and options.

E. Architect/Engineer will review or take appropriate action for submittals. Review is only to determine general conformance with design shown in contract documents.

F. Architect/Engineer review of submittals shall not relieve contractor of responsibility for deviation from requirements of the contract documents or from errors or omissions within submittals.

G. No portion of the work requiring submittals shall be commenced until the Architect/Engineer has reviewed the submittal.

H. Electronic Floor Plan Drawings in AutoCAD 2002 format may be requested for use in preparation of shop drawings. Morrissey Engineering reserves the right to reject requests for electronic drawings. Electronic files shall be prepaid at $50/sheet. Submit written request to Morrissey Engineering or email request to info@morrisseyengineering.com. Indicate the project name, and floor plan sheets requested. The use of these drawings is intended solely for preparation of drawings required by this specification. Copyright law prohibits any other use. The user of the electronic files assumes full responsibility for the accuracy and scale of the drawings.

I. See “Submittal Schedule” at the end of Section 26 0100 – General Electrical Requirements.

1.10 OPERATION AND MAINTENANCE MANUALS
A. Assemble three (3) complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:
   a. Emergency instructions and procedures.
   b. System, subsystem, and equipment descriptions, including operating standards.
   c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
   d. Description of controls and sequence of operations.
   e. Piping and wiring diagrams.

2. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.11 PROJECT RECORD DOCUMENTS

A. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally.
   2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
   3. Mark important additional information that was either shown schematically or omitted from original Drawings.
   4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
   5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials and equipment used in the construction of the project shall be new unused and undamaged unless otherwise specified. Materials and equipment shall be of latest design standards of manufacturer specified.

B. Materials and equipment are limited by the requirements of the contract documents. Material and equipment shall be provided in accordance with the following:
   1. Basis of Design Products: Basis of Design Products are those products around which the project was designed in terms of capacity, performance, physical size and quality. Basis of Design Products shall be provided unless substitutions are made in accordance with this specification.
   2. Substitutions: Substitutions are product of manufacturers other than listed as Basis of Design. Substitutions shall meet each of the following requirements and shall be subject
to prior approval. Submissions requesting prior approval shall be received by the engineer no less than ten (10) days prior to project bid date.

a. The product shall be manufactured by one of the acceptable manufacturers listed in the contract documents.
b. The product shall meet or exceed the requirements of the contract documents in terms of quality, performance, suitability, appearance and characteristics.
c. The contractor providing the substitution shall bear the total cost of all changes due to substitutions. These may include but are not limited to redesign costs and increased work by other contractors or the Owner.
d. The Architect/Engineer shall be the sole judge of the suitability of the substitution items.

C. Verify installation details and requirements for materials and equipment furnished by others and installed under this contract.

PART 3 - EXECUTION

3.01 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Provide 4 hours training in up to two separate sessions.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner and Architect/Engineer with at least seven days' advance notice.

B. Instructional videos may be produced in conjunction with the operation instructions required above.

3.02 STARTING AND ADJUSTING

A. Start and test all equipment and operating components to confirm proper operation. Test and adjust all systems to achieve designed capacity and performance.

B. Provide three (3) copies of all test report to the Architect/Engineer for review prior to date of substantial completion.

C. All equipment and systems discrepancies shall be corrected prior to final acceptance.

3.03 TEMPORARY POWER AND LIGHTING

A. Electric Power Service: Provide temporary electric power from Owners electric system without payment of use charges.

B. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and construction equipment.

C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

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<thead>
<tr>
<th>Section Name</th>
<th>Product Data</th>
<th>Shop Dwgs</th>
<th>Test Reports / Quality Control</th>
<th>Warranty</th>
<th>Extra Materials</th>
<th>O&amp;M Data</th>
<th>Record Docs</th>
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END OF SECTION
SECTION 26 0500
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes the following basic electrical materials and methods and shall apply to all phases of the work specified, indicated on the drawings or required to provide for complete installation of electrical systems.
   1. Conduits.
   2. Building wire and connectors.
   4. Outlet boxes.
   5. Electrical identification.
   6. Electrical demolition.
   7. Work in existing buildings
   8. Cutting and patching for electrical construction.
   10. Touchup painting.

1.03 MATERIAL QUALITY ASSURANCE
A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

1.04 COORDINATION
A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
B. Sequence, coordinate, and integrate installing of electrical materials and equipment with other trades.
C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Each contractor shall make provisions for delivery and safe storage of materials. Materials shall be delivered in a timely manner to expedite the work.
B. Protect stored piping, supplies and equipment from cold, moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

PART 2 - PRODUCTS

2.01 CONDUITS
A. Electrical metallic tubing (EMT): ANSI C80.3 and UL 797, zinc-coated steel with steel or die cast, set-screw or compression type fittings.
B. Flexible metal conduit (FMC): UL 1, Zinc-coated steel.
C. Intermediate metal conduit (IMC): ANSI C80.6 and UL 1242, zinc-coated steel, with threaded fittings.
D. Liquidtight flexible metal conduit (LFMC): Flexible steel conduit with PVC jacket and complying with UL 360.
E. Rigid nonmetallic conduit (RNC): NEMA TC 2 and UL 651, EPC-40 (schedule 40) PVC, with NEMA TC3 fittings.

F. Installation location shall determine conduit type permitted.
   1. For indoor installations:
      a. Exposed: EMT.
      b. Concealed: EMT.
      c. Connection to vibrating equipment: FMC; except in wet or damp locations, use LFMC.
      d. Boxes and enclosures: NEMA 250, Type 1, unless otherwise indicated.
   2. Use the following conduits for outdoor installations:
      a. Exposed: IMC.
      b. Underground: RNC.
      c. Boxes and enclosures: NEMA 250, Type 3R or Type 4.
   3. At motors:
      a. Connect motors and equipment subject to vibration, noise transmission, or movement with FMC of 72-inch maximum length.
      b. Damp locations: LFMC.

G. Conduit fittings: Specifically designed for the conduit type with which used. Comply with NEMA FB 1 and UL 514B.

2.02 CONDUCTORS
A. Conductors and conductor insulation: Comply with NEMA WC 70.
B. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
C. Conductors, larger than No. 10 AWG: Stranded copper.
D. Insulation: thermoplastic, rated at 75 deg C minimum.
   1. Feeders: Type THHN/THWN insulated conductors in conduit.
   2. Underground Feeders and Branch Circuits: Type THWN in conduit.
   3. Branch Circuits: Type THHN/THWN insulated conductors in conduit.
   4. Circuits over 100 feet from GFCI devices and all circuits from line isolation panels: Low-leakage XHHW in conduit.
E. Wire connectors and splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.
F. Unless otherwise indicated on the drawings, circuits are to be 20 amps with #12 AWG wire.

G. **A green ground shall be installed with all branch and feeder circuits.** Unless otherwise indicated on the drawings, ground wires are to be #12 AWG.
H. Provide a dedicated neutral conductor for each 120V and 277V branch circuit unless otherwise indicated on drawings.

2.03 SUPPORTING DEVICES
A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
B. Metal items for use outdoors or in damp locations: Hot-dip galvanized steel.
C. Slotted-steel channel supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
D. Conduit and cable supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
   1. In general, use the following support methods for outdoor conduit installations:
      a. Individual exposed conduit: 1” and smaller; 2 hole straps.
      b. Individual exposed conduit: 1-1/4” and larger; Minerallac.
      c. Paired individual exposed conduit: Minerallac.
      d. Rack exposed conduit: Unistrut with strut straps.
      e. Concealed in concrete pour: Approved iron tie wire.
   2. In general, use the following support methods for indoor conduit installations:
      a. Individual exposed conduit: 1” and smaller; 2 hole straps.
      b. Individual exposed conduit: 1-1/4” and larger; Minerallac.
c. Individual lighting and power above lay-in ceilings: Dedicated ceiling wire with Caddy clips.

d. Racked exposed or concealed conduit: Unistrut with strut straps.

E. Pipe sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Expansion anchors: Carbon-steel wedge or sleeve type.

G. Toggle bolts: All-steel springhead type.


2.04 BOXES

A. Hollow wall and ceiling spaces: Outlet boxes for concealed applications shall be 4” square with single or multiple gang plaster ring in round or square configuration to match the device or fixture being installed. Depth of ring shall be selected so that face of ring is recessed back from face of finished surface by approximately 1/8”.

B. Masonry walls: Outlet boxes in masonry walls shall be 4” square with single or multiple gang masonry rings with square edges. Masonry boxes may also be used where 4” square boxes are impractical. Slush boxes in place to prevent movement within walls. Flush mounted boxes and conduit are to be used unless otherwise indicated.

C. Exposed exterior boxes: Where exposed boxes are required, they shall be the cast type with threaded hubs and gasketed covers. Use of these boxes is by approval only. Flush mounted boxes and conduit are to be used unless otherwise indicated.

D. Interior junction boxes: Interior junction boxes shall be 4” square minimum with knock outs as required. Larger boxes may be required and shall be sized per NEC. Provide a flat steel coverplate.

E. Specialty junction boxes larger than 4 11/16”: Junction and pull boxes shall be sized per NEC and arranged to facilitate pulling or splicing. Boxes shall be steel without knock outs, with hinged or screw on cover plates.

F. Floor boxes: See “Wiring Devices” Specification or the drawings.

2.05 ELECTRICAL IDENTIFICATION

A. Underground warning tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
   1. Not less than 6 inches wide by 4 mils thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.
   4. Printed legend that indicates type of underground line.

B. Tape markers for wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

C. Engraved-plastic labels, signs, and instruction plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

2.06 ACCESS DOORS

A. Prime coated 14 gauge steel, flush, with screw driver operated cam lock. Frame to accommodate construction type; size as indicated.

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

A. Neatness and craftsmanship shall be a priority. Installations shall be subject to regular observations performed by the Engineer or the Engineer’s Representative. If an installation is deemed unsatisfactory by the Engineer or the Engineer’s Representative due to quality of workmanship, code conflicts or deviations from the Construction Drawings or Specifications, the Contractor shall remedy the installation to the satisfaction of the Engineer.

B. Inspect installed components for damage and faulty work, including the following:
   1. Conduits.
   2. Building wire and connectors.
   4. Electrical identification.
5. Concrete bases.
6. Cutting and patching for electrical construction.
7. Touchup painting.

C. Headroom maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

D. Materials and components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

F. Right of way: Give to conduits and piping systems installed at a required slope.

3.02 CONDUIT AND CABLE INSTALLATION

A. Conceal conduit and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install conduit and cables at least 6 inches away from parallel runs of flues or hot-water pipes. Locate horizontal conduit runs above water piping.

C. Use temporary conduit caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use conduit and cable fittings compatible with conduit and cables and suitable for use and location.

F. Conduits may be installed embedded in concrete under the following conditions:
   1. Contractor shall receive approval from a structural engineer if conduit is to be located in structural concrete.
   2. Leave at least 2-inch concrete cover.
   3. Do not displace more than 1/3 of the concrete thickness of the slab. For example, if the slab thickness is 3”, maximum conduit size is to be 1” OD.
   4. Secure conduit to reinforcing rods to prevent sagging or shifting during concrete placement.
   5. Where multiple conduits are run in an area, space conduit laterally to prevent voids in concrete. Fan out conduit runs for a minimum spacing of no less than 3 times the diameter of the larger conduit in a group. Do not place conduits within 12” of supporting beams, walls and columns.
   6. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
   7. Where floor finish is to be exposed concrete, avoid excessive underfloor conduits and maximize cover over conduits to avoid floor cracking.
   8. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

G. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows where elbows can be installed parallel; otherwise, provide field bends for exposed parallel conduits.

H. Install pull wires in empty conduits. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

I. Install interior telephone and signal system conduits in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

J. Install exterior telephone and signal system conduits in maximum lengths of 500 feet and with a minimal number of 90-degree bends.

K. Utilize sweep elbows for all telephone and signal system conduits 2” and larger.
L. All conduits routed through unfinished spaces shall be routed as high as allowable to avoid future conflicts with build out.
M. All conduits routed exposed in finished spaces shall be painted to match the surroundings. Unless otherwise required by Code, this shall include fire alarm, communication, or other color-specific conduits.
N. Route conduits parallel to building structural members in a neat and orderly manner.

3.03 CONDUIT SUPPORT INSTALLATION
A. Install support devices to securely and permanently fasten and support electrical components.
B. Install individual and multiple conduit hangers and riser clamps to support conduits. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
C. Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
D. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
E. Simultaneously install vertical conductor supports with conductors.
F. Separately support cast boxes that are threaded to conduits and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to conduits on opposite sides of the box and support the conduit with an approved fastener not more than 24 inches from the box.
G. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength. Use factory hardware for all connections and assemblies including 45 and 90 degree attachment hardware.
H. Install sleeves for cable and conduit penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and conduit penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
I. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
   1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
   2. New concrete: Concrete inserts with machine screws and bolts.
   3. Light steel: Sheet-metal screws.
   4. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.04 WIRING INSTALLATION
A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer’s published torque-tightening values.

3.05 POSITION OF DEVICE OUTLETS
A. Outlets shall be installed at the height indicated below unless otherwise noted. All heights of outlets are measured from finished floor to centerline of device. Heights may be adjusted as necessary to clear wall mounted cabinets, fin tube convectors, unit heaters, etc. Where installed in masonry walls, mounting heights may be adjusted to correspond to block coursing. In no case shall outlets be mounted below 15” or switches above 48”:
   1. Wall switches 44”.
   2. Receptacle outlet (general) 16”.
   3. Receptacle outlet serving countertops 4” above counter or top of backsplash unless otherwise noted.
   4. Exterior receptacles 24”
   5. Communications outlet Match adjacent outlets.
6. Communication system call station 44”.
7. Exit lights 4” between top of door frame and bottom of exit light where possible.

3.06 ELECTRICAL IDENTIFICATION
A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
C. Self-Adhesive Identification Products: Clean surfaces before applying.
D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
E. Install warning markers directly above power and communication lines during trench backfilling for underground power, control, signal, and communication lines. Locate marker 6 to 8 inches below finished grade unless required otherwise by NEC. Markers shall be continuous and detectable with a metal detector from above ground after backfilling. Provide one strip of marker for each 16 inches of width if multiple lines are installed in a common trench or concrete envelope.
F. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
   1. Match existing building identification
G. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
   1. Match existing building identification

3.07 FIRESTOPPING
A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly and to resist passage of smoke and other gases. Products designed to achieve a fire or smoke resistance rating shall not be used in locations where such ratings are not required by AHJ. Coordinate location requirements with other disciplines and AHJ prior to installation.
1. Limit air leakage to 5.0cfm per square foot tested in accordance with UL 1479.
2. Materials labeled by a qualified testing agency acceptable to AHJ.
3. Comply with manufacturer's written installation instructions and published drawings
4. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   a. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   b. Contractor's name, address, and phone number.
   c. Designation of applicable testing and inspecting agency.
   d. Date of installation.
   e. Manufacturer's name.
   f. Installer's name.
B. All firestopping assemblies shall be from one manufacturer. Match manufacturer used by other trades or as directed by general contractor.
C. Where electrical outlets are to be installed in fire rated walls, provide FlameSafe FSP1077 putty pads or equal to maintain adequate fire rating.
D. Where lighting fixtures or other electrical devices are to be installed in fire rated ceilings, provide Tenmat Fire Rated Light Covers or equal to maintain adequate fire rating.

3.08 DEMOLITION
A. Disconnect, demolish, and remove construction indicated in specifications and drawings.
B. The Owner shall have first salvage rights to all fixtures, devices and equipment removed. Present removed materials to owner’s representative. Materials not retained by owner’s representative shall be removed from project site.
C. If equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
D. Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
E. Remove all accessible conduit unless otherwise noted.
F. Remove branch circuit conductors and low voltage cable in area of demolition not reused in new work or planned for future use. Where left for future use, label wire at both ends and at each junction box.
G. Power to existing areas not being remodeled shall be maintained at all times except for short term outages necessary for reconnection of existing circuits. Coordinate and schedule outages with owner.
H. Coordinate demolition with the work of other trades. Provide temporary power as required to allow the work of other trades to proceed or as required to allow the owner to occupy the space.
I. See architectural plans to determine project phasing requirements. Electrical circuits serving areas not under construction shall remain active until those areas are turned over to the contractor for construction.
J. Work abandoned in place: Cut and remove underground conduit a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

3.09 WORK IN EXISTING BUILDINGS
A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner to minimize conflicts with the Owner’s operations.
B. Schedule all work in advance with the owner. Do not proceed with work without the Owner’s written approval.
C. Notify Owner of noisy operations and schedule in advance.
D. The Owner shall have the right to direct work to secure safe and proper progress and quality of work.
E. Do not interrupt utilities without Owner’s written approval of time and duration. Interruptions shall be the minimum required for completion of work and performed during the hours of 10:00 PM-6:00 AM Monday through Friday or 6:00 PM Saturday through 6:00 AM Monday.
F. The Owner shall be notified before starting welding or cutting. Fire extinguishers shall be immediately accessible when welding or cutting with an open flame or arc. Welding or cutting with an open flame or arc shall be stopped not less than one hour before leaving the premises.
G. Existing electrical items that interfere with the proper installation new work shall be removed or relocated as required or as directed by the Architect/Engineer.
H. Maintain downstream circuit continuity to equipment to remain active.
I. Where breakers are indicated to be installed in existing panelboards, remove panel covers and verify all connection details prior to ordering of breakers. Provide all required hardware for installation of breakers in existing panels.

3.10 CUTTING AND PATCHING
A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of trades involved.
B. Repair cut surfaces to match adjacent surfaces.

3.11 CONSTRUCTION LAYOUT
A. Layout work in advance of installation using data and measurements from the site, the appropriate architectural and structural drawings and shop drawings.
B. Confirm adequate clearance for installation, operation, maintenance and code required clearance including items installed by other contractors.
C. If layout to provide clearance is not possible, promptly notify Architect/Engineer for clarification.

3.12 DATA AND MEASUREMENTS
A. The data given herein and on the drawings is as accurate as could be secured. The existence and location of construction as indicated is not guaranteed. Before beginning work investigate and verify the existence and location of items affecting work. Obtain exact locations, measurements, levels, etc., at the site and adapt work to actual conditions.

B. Only site measurements may be utilized in calculations. Mechanical and electrical drawings are diagrammatic or schematic.

3.13 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.14 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes receptacles, connectors, switches, and finish plates.
B. This Section includes floor boxes and poke-thru floor fittings.

1.03 DEFINITIONS
A. GFCI:  Ground-fault circuit interrupter.
B. DL:  Damp location as defined in NFPA 70, Article 100.
C. WP:  Weatherproof for wet locations as defined in NFPA 70, Article 100.

1.04 SUBMITTALS
A. Product Data:  For each product specified.

1.05 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories:  Listed and labeled as defined in NFPA 70,
   Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with NEMA WD 1.
C. Comply with NFPA 70.

1.06 COORDINATION
A. Receptacles for Owner-Furnished Equipment:  Match plug configurations.
   1. Cord and Plug Sets:  Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Manufacturers:  Subject to compliance with requirements, provide products by one of the
   following:
   1. Floor Boxes
      a. Hubbell
      b. Wiremold
   2. Other Wiring Devices
      a. Bryant Electric, Inc.
      b. Cooper Wiring Devices.
      d. Leviton Manufacturing Co., Inc.
      e. Pass & Seymour/Legrand; Wiring Devices Div.

2.02 RECEPTACLES
A. Description:  Impact-resistant nylon face with finder groove, thermoplastic back body, and one-
   piece triple-wipe power contacts.  Side and back wired, back wire terminals use screw pressure
   plates.
B. Duplex Straight-Blade Receptacles:  Specification grade; 20 ampere, 125 volt rated.
   1. Equal to:  Pass & Seymour #5362
C. GFCI Receptacles:  Design units for installation in a 2-3/4-inch deep outlet box without an
   adapter.
   1. Equal to:  Pass & Seymour #2095.
D. Receptacles on wood / wood laminate surfaces shall be black.

2.03 CORD AND PLUG SETS
A. Description:  Match voltage and current ratings and number of conductors to requirements of
   equipment being connected.
   1. Cord:  Rubber-insulated, stranded-copper conductors, with type SOW-A jacket.  Green-
      insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30
      percent.

2.04 SWITCHES
A. Snap Switches: Specification grade; 20 ampere, 120/277 volt rated; side and back wired; quiet type.
   1. Poles: Provide switches in single-pole, double-pole, three-way, and four-way configurations as indicated on the drawings.
   2. Equal to: Pass & Seymour #20AC

2.05 WALL PLATES
A. Single and combination types match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Select one of five subparagraphs below. Coordinate with Division 9 Section "Painting."
   4. Material for Finished White Wall Spaces: 0.04-inch thick, Type 302, satin-finished stainless steel.
   5. Ceiling mounted wall plates: White for white surfaces, black for wood / wood laminate surfaces.

2.06 POKE-THRU FLOOR FITTINGS
A. Description: Multi-service poke-thru fitting with power and communications outlets in a common flush mounted floor assembly meeting UL requirements for scrub water exclusion on top cover. Installs in a core drilled opening and UL classified to maintain a minimum 2 hour fire rating of floor.
   1. Refer to drawings for product information
   2. Provide with two duplex receptacles and flush cover (black)
   3. Provide conduits with pull strings from floor box low voltage compartment (1-1/4" C. to above accessible ceiling). Provide with 1125CHA bottom assembly.
   4. Communications Outlets: Provide device frame for designer-style opening in sub-plate communications compartment. Device frame shall have openings for Owner’s communications outlets, coordinate configuration with Engineer.

PART 3 - EXECUTION
3.01 INSTALLATION
A. Install devices and assemblies plumb and secure.
B. Install wall plates when painting is complete.
C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multi-gang wall plates.
D. Protect devices and assemblies during painting.
E. Provide a GFCI receptacle for each device indicated on the drawings. Do not connect GFCI receptacles to protect downstream devices.
F. Set floor boxes level and trim after installation to fit flush to finished floor surface.
G. Provide full-capacity external conduit connections between all compartments of multi-service floor boxes. All compartments shall be capable of installed devices regardless of internal wire tunneling arrangement of floor box.

3.02 IDENTIFICATION
A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
   1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
   2. Receptacles: Identify serving panelboard and circuit number on faceplate of all receptacles.
   3. Conductors Serving Receptacles: Identify serving panelboard and circuit number. Use durable wire markers or tags within outlet boxes.

3.03 CONNECTIONS
A. Connect wiring device grounding terminal to outlet box with bonding jumper.
B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values.

3.04 FIELD QUALITY CONTROL
   A. Test wiring devices for proper polarity and ground continuity.
   B. Test GFCI operation with fault simulations according to manufacturer’s written instructions.
   C. Replace damaged or defective components.

3.05 CLEANING
   A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION
SECTION 26 5100
LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. See 26 05 00 “Basic Electrical Materials and Methods” for electrical materials and methods.
C. See 26 27 26 "Wiring Devices" for manual light switches and device finishes.
D. See 26 52 00 “Lighting Control” for lighting control devices.

1.02 SUMMARY
A. This Section includes luminaires, lamps, ballasts, drivers, emergency lighting units, emergency battery packs, emergency lighting inverters, exit signs, luminaire supports, poles, and accessories.

1.03 SUBMITTALS
A. Product Data: For each luminaire type arranged in order of type designation. Include data on features, accessories, and the following:
   1. Physical description including dimensions, construction, and finish.
   2. Lamp and ballast data indicating rated life, output, CCT, CRI, and energy use.
   3. LED and driver data indicating rated life, output (delivered), CCT, CRI, and energy use.
   4. Photometric report including IES files.
B. Product Data: For each pole type arranged in order of type designation. Include data on features, accessories, and the following:
   1. Include data on construction details, profiles, EPA, cable entrances, materials, finishes, dimensions, weight, rated design load, and ultimate strength of individual components.
   2. Anchor bolts.
C. Product Data: For each type and rating of emergency lighting inverter. Include features, performance, electrical ratings, operating characteristics, furnished options, and accessories.
D. Shop Drawings: For non-standard or custom luminaires. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, and components.
   2. Wiring Diagrams: For power, signal, and control wiring.
E. Maintenance Data: For luminaires to include in maintenance manuals specified in Division 1.
F. Samples for Initial Selection: For each luminaire requested by architect or engineer.
   1. Include Samples of luminaires and accessories involving color and finish selection.

1.04 QUALITY ASSURANCE
A. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with NFPA 70 and 101.
C. Emergency lighting units, inverters, exit signs, and batteries: Comply with UL 924.
D. Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.05 COORDINATION
A. Luminaires, Mounting Hardware, and Trim: Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
B. Coordinate layout and installation of devices with other construction including structural members, underground utilities, above-grade utilities, site design, and building elements.
C. Coordinate layout and installation of emergency lighting inverters with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels. Label with engraved nameplates.

1.06 WARRANTY
A. Include labor allowance required for replacement on-site at no extra cost to the Owner within 1-year construction warranty. Transfer remainder of the manufacturer's warranty including ballast manufacturer's labor stipend to owner after 1-year construction warranty.
B. Ballast and Driver Warranty: 5-year replacement warranty.
C. Emergency Battery Warranty: 3-year pro-rated warranty.
D. LED System Warranty: 5-year replacement warranty.
E. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) and luminaires that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a 5-year warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Luminaires and Poles: Subject to compliance with requirements, provide one of the products indicated for each designation in the Luminaire and Site Lighting Schedules on the drawings.
B. Emergency Lighting Inverters: Subject to compliance with requirements, provide one of the products indicated for each designation on the drawings.

2.02 LUMINAIRE AND LUMINAIRE COMPONENTS, GENERAL
A. Metal Parts: Free from burrs, sharp corners, and edges.
B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.
D. Finishes: Manufacturer's standard, unless otherwise indicated.
   1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.

2.03 LED LIGHT SOURCES
A. LED Light Source Requirements:
   1. Rated life (L70): Minimum 50,000 hours as defined by IES LM80 and TM21.
   2. Color Rendering Index (CRI): 80 CRI minimum.
   3. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
B. LED Driver Requirements:
   1. 0-10V Dimming
   2. Total Harmonic Distortion Rating: Less than 20 percent.
   3. Ambient temperature rating: -40° to +55° C
   4. Power Factor (100% output): >0.95
   5. Flickering: LED drivers shall conform to IEEE P1789 standards. Alternatively, manufacturers must demonstrate conformance with product literature and testing which demonstrates this performance. Submit % flicker in 1% increments for full range of dimming starting at 500 mA for full output reading. Systems that do not meet IEEE P1789 will not be considered.

2.04 EXIT SIGNS
A. General Requirements:
   1. Comply with NFPA 101, UL924, and local AHJ for sign colors, visibility, luminance, and lettering size.
   2. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
B. Internally Lighted Signs (AC type or Battery type):
   1. Light Source: Light-emitting diodes with 70,000 hour minimum rated lamp life.
   2. Battery type - Integral automatic charger in a self-contained power pack.

2.05 EMERGENCY LIGHTING UNITS
A. General Requirements: Self-contained units, wall or ceiling mounted. Comply with UL 924. Units include the following features:
   1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and warranty.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.06 LUMINAIRE SUPPORT COMPONENTS
A. Comply with Division 26 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.
B. Twin-Stem Hangers: Two, 1/2-inch (12-mm) steel tubes with single canopy arranged to mount a single luminaire. Finish same as luminaire.
C. Rod Hangers: 3/8-inch minimum diameter, cadmium-plated, threaded steel rod.

2.07 EMERGENCY LIGHTING INVERTERS
A. Fast-Transfer Central Battery Equipment: Automatically sense loss of normal ac supply and use a solid-state static switch to transfer load. Transfer in 50ms or less from normal supply to battery-inverter supply.
B. Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.
C. Output Voltage Waveform: Pure sine wave with maximum 3 percent TDD throughout battery operating-voltage range, for 100 percent linear load.
D. Maintenance Bypass Mode: Manual operation only; bypasses central battery equipment power circuits (inverter and static transfer switch); requires local operator selection at central battery equipment. Bypass Overload Capability shall be 1.5 times the base load current.
E. Integral Output Disconnecting Means and OCPDs: Thermal-magnetic circuit breakers, complying with UL 489; voltage rating matching unit output voltage rating; 20 A, single pole.
F. Capacity as indicated on the drawings. Manufacturer to verify capacity based on loads served by device and overload capacity of inverter.

PART 3 - EXECUTION
3.01 INSTALLATION
A. Comply with NECA 1.
B. Luminaires: Set level, plumb, and square with ceiling and walls. Secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each luminaire.
C. Align luminaires for optimum directional alignment of light distribution.
D. Remote Mounting of Ballasts or Drivers: Distance between the ballast/driver and fixture shall not exceed that recommended by manufacturer. Verify wire size and maximum distance between ballast/driver and luminaire with manufacturer.
E. Support for luminaires in or on Grid-Type Suspended Ceilings: Use grid for support.
   1. Install a minimum of four ceiling support system rods or wires for each luminaire. Locate not more than 6 inches (150 mm) from luminaire corners.
   2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner.
   3. Luminaires of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
F. Suspended Luminaire Support: As follows:
   1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Continuous Rows: Suspend from cable installed according to luminaire manufacturer's written instructions and details on Drawings.

G. Burn-In: Continuously illuminate (burn-in) lamps per manufacturer's recommendations. Continuously illuminate LED light sources for 100 hours prior to substantial completion.

3.02 CONNECTIONS
A. Ground equipment: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.03 FIELD QUALITY CONTROL
A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
B. Provide instruments to make and record test results.
C. Test as follows:
   1. Verify normal operation of each luminaire after installation.
   2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
   3. Verify normal transfer to battery source and retransfer to normal.
D. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
E. Perform a load-duration test for inverters at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 CLEANING AND ADJUSTING
A. Clean luminaires internally and externally after installation. Use methods and materials recommended by manufacturer.
B. Perform startup service for inverters. Engage a factory-authorized service representative if recommended by manufacturer or required for warranty. Train Owner's maintenance personnel to adjust, operate, and maintain emergency lighting inverters, and to use and reprogram microprocessor-based control, monitoring, and display functions.
C. Contractor shall perform initial aiming of luminaires based on information indicated on drawings. Final aiming shall be completed by contractor under direction of engineer. Final aiming shall take place after sun has set and contractor shall make all required accommodations to access luminaires (lifts, etc.) - coordinate exact time with engineer.

END OF SECTION
SECTION 26 5200
LIGHTING CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. See 26 05 00 “Basic Electrical Materials and Methods” for electrical materials and methods.
C. See 26 27 26 "Wiring Devices" for manual light switches and device finishes.
D. See 26 51 00 “Lighting” for luminaires, lamps, ballasts, drivers, emergency lighting units, emergency battery packs, emergency lighting inverters, exit signs, luminaire supports, and poles.
E. [See 27 41 34 “Audio Visual Systems” for audio visual equipment.]
F. [See 23 09 93 “Sequence of Operations for HVAC Controls” for Building Management System.]
G. [The Owner has contracted directly with the Commissioning Authority (CxA) for this project. All Contractors shall cooperate with the CxA to complete all required commissioning. Specification Section 01 9113 defines the Contractor’s responsibilities with respect to the process. The Contractor shall review this section and shall include in their bids the work associated with the commissioning effort described.]

1.02 SUMMARY
A. This Section includes system software interfaces, system backbone and integration equipment, network lighting control panels, network lighting control devices, and accessories.
B. [This Section includes system software interfaces, network lighting control panels, network lighting control devices, and accessories. Provide stand-alone network control systems for each space/zone (no system backbone or communication bridges).]

1.03 SUBMITTALS
A. Product Data: For each lighting control panel and device. Include data on features, accessories, and the following:
   1. Bill of Materials
   2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
   3. Information Technology connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
   4. Other Diagrams and Operational Descriptions - as needed to indicate system operation or interaction with other system(s).
B. Shop Drawings:
   1. Riser diagrams showing device wiring connections of system backbone and typical per room type.
   2. Floor plans indicating location of lighting control panels and devices, and wiring connections.
   3. Occupancy Sensor Layout Drawings: Scaled floor plans with lighting control manufacturer’s layout of occupancy sensors. Sensor layout and quantity shall completely cover each area and show coverage patterns for each sensor.
C. Maintenance Data:
   1. Include in maintenance manuals specified in Division 1.
      a. Hardware and Software Operation Manuals.
      b. Maintenance service agreement.
      c. Software service agreement.
      d. Warranty documentation.

1.04 QUALITY ASSURANCE
A. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with NFPA 70, NFPA 101, and UL924.

1.05 WARRANTY
A. Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within warranty period.

1. Failures include but are not limited to faulty operation of lighting control hardware or firmware.
2. Minimum Warranty Period: Five years from date of substantial completion.

1.06 PREINSTALLATION MEETINGS
A. Preinstallation Coordination Meeting: For network lighting controls conduct meeting(s) [as videoconference] [or] [at Project site] after approved submittals and prior to installation.

1. Attendees: Installers, fabricators, representatives of manufacturers, and administrators for field tests and inspections. Notify Architect, Engineer, and Construction Manager of scheduled meeting dates.
   a. [Meeting shall include Audio Visual (AV) contractor to discuss system integration.]
   b. [Meeting shall include BMS contractor to discuss system integration.]
2. Engage factory-authorized service representative to attend preinstallation meeting and review the submittal drawing, sequence of operation, and device installation best practices with Project team.
3. [Engage factory-authorized service representative to perform cellular signal strength measurements during site walk through and compare to Project plans to verify the placement of cellular antennas and quantity of lighting control system RF access points.]

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Lighting Control Equipment: Subject to compliance with requirements, provide lighting control equipment from one of the following manufacturers, all equipment should be from one consistent manufacturer:
   1. Acuity Brands Lighting nLight
   2. Wattstopper DLM
   3. Encelium
   4. Lutron Quantum

2.02 SYSTEM PERFORMANCE REQUIREMENTS
A. System Architecture:
   1. System architecture based upon the following concepts:
      a. Network intelligent lighting control devices.
      b. Standalone lighting control zones using distributed intelligence.
      c. Optional system backbone for remote, time-based, and global operation.
   2. Intelligent lighting control devices with individually addressable network communication capability and having one or more basic lighting control components including: occupancy sensor, photocell, relay, dimming output, contact closure input, analog 0-10 V(dc) input, and manual entry station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure permissible to minimize overall system device count.
   3. Networked luminaires and intelligent lighting control devices support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices.
   4. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local entry stations without requiring connection to a higher-level system backbone.
      a. Lighting control zones (wired and wireless) support at least 128 devices per zone.
      b. Capable of being networked with a higher-level system backbone to provide time-based control, control from inputs or systems external to control zone, and remote configuration and monitoring through a software interface.
5. Networked luminaires and intelligent lighting control devices with distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones operate according to their defined default settings and sequence of operations.

6. System to include one or more system controllers that provide time-based control.

7. System controller provides means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol.

8. System devices support firmware update, either remotely or from within the application space, for purposes of upgrading functionality at a later date.

9. System capable of reporting lighting system events and performance data to management software for display and analysis.

B. BMS System Integration Capabilities:

1. Capable of interface with third-party building management systems (BMS) to support two-way communication using BACnet/IP protocol, BACnet MS/TP protocol, and RESTful API including the following system integration capabilities:
   a. "Write" messages for control of individual devices, including control of relay and dimming output.
   b. "Write" messages for control of groups of devices through a single command, including control of relay and dimming output of all devices.
   c. "Read" messages for individual device status information.
      1) Available status will vary based on device type and capabilities, which may include relay state, dimming output, power measurement, occupancy sensor status, and photocell light measurement.
   d. "Read" messages for group status information for occupancy, relay state, and dimming output.
   e. Activation of pre-defined system Global Profiles.

C. Third Party System Integration Capabilities:

1. Activation of Global and Local Profiles from third-party systems via dry contact closure output signals or digital commands via RS-232.

2. Scene activation, on/off, and Raise/Lower/Go-to-level commands from third-party systems via RS-232 digital commands.

D. Supported Sequence of Operations:

1. Control Zones:
   a. Local Control Zones: Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) capable of transmitting and tracking occupancy sensor, photocell, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within area. These will also be referred to as local control zones.
   b. Adjacent Control Zones: Networked luminaires and intelligent lighting control devices capable of tracking occupancy broadcasts from adjacent zones. When this feature is enabled, luminaire output for a vacant zone will reduce to a configurable dimmed state if one or more adjacent zones are occupied. Luminaires will turn off when both primary and adjacent zones are vacant.
   c. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy, photocell inhibit, and switch commands available across multiple controllers.

2. Entry Station Capabilities:
   a. On/Off of a local or global control zone.
   b. Continuous dimming control of light level of a local or global control zone.
   c. Multi-Way Control: Multiple entry stations capable of controlling the same local or global control zones, to support "multi-way" switching and dimming control.
   d. Preset Scenes that activate a specific combination of light levels across multiple local and global channels.
e. Local Profile Support: Profile Scenes that modify the sequence of operation for devices in the area (group) in response to a button press to dynamically optimize occupant experience and lighting energy usage.
   1) Entry stations able to manually start and stop local profiles, or local profile capable of ending after a specific duration of time between five minutes and 12 hours.
   2) Configurable Parameters:
      a) Fixture light level.
      b) Occupancy time delay.
      c) Response to occupancy sensors (including enabling/disabling response).
      d) Response to daylight sensors (including enabling/disabling response).
      e) Enabling/disabling entry stations.
   3) Three-Way or Multi-Way Control: Multiple entry stations capable of controlling the same local and global control zones, to support "multi-way" preset scene and profile scene control.

3. Occupancy Sensing Capabilities:
   a. Occupancy sensors configurable to control a local or global zone.
   b. Multiple occupancy sensors capable of controlling the same local or global zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.
   c. Occupancy sensing sequence of operation modes:
      1) On/Off Occupancy Sensing.
      2) Partial-On Occupancy Sensing.
      3) Partial-Off Occupancy Sensing.
   d. On/Off, Partial-On, and Partial-Off Occupancy Sensing Modes Sequence of Operation:
      1) Occupancy automatically turns lights on to a designated level when occupancy is detected. Designated occupied light level support at least 100 dimming levels.
      2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
      3) System capable of combining Partial-Off and Full-Off operation by dimming lights to a designated level when vacant and turning the lights off completely after an additional time delay.
      4) Photocell readings, if enabled in occupancy sensing control zone, automatically adjust light levels during occupied or unoccupied conditions as necessary.
      5) Entry station activation changes the dimming level or turn lights off as selected by the occupant. Lights optionally remain in this manually specified light level until the zone becomes vacant. Upon vacancy, normal sequence of operation resumes.
   e. Vacancy Sensing or Manual-On/Automatic-Off Mode Sequence of Operation:
      1) Activation of an entry station is required turn lights on. System capable of programming the zone to turn on to either a designated light level or previous user-set light level. Initially occupying the space without using an entry station must not result in lights turning on.
      2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
      3) System capable of dimming the lights when vacant and then turning the lights off completely after an additional time delay.
      4) System capable of an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy results in the lights reverting to the previous level. After the grace period has expired, the use of an entry station is required to turn lights on.
5) Photocell readings, if enabled in the Occupancy Sensing control zone, capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary.

6) Entry station interaction changes the dimming level or turn lights off as selected by occupant. Lights remain at manually specified light level until zone becomes vacant; normal sequence of operation resumes upon vacancy.

f. Occupancy time delays before dimming or shutting off lights separately programmable for all control zones from 15 seconds to 2 hours.

4. Photocell Sensing Capabilities (Automatic Daylight Sensing):
   a. Photocell devices configurable to control a local zone.
   b. Photocell-Based Control:
      1) Continuous Dimming: Control zone automatically adjusts dimming output in response to photocell readings, to maintain a minimum light level consisting of both electric light and daylight sources. Photocell response configurable to adjust set point and dimming rates.

5. Schedule Capabilities:
   a. System capable of time schedules for time-of-day to override devices including offsets from dusk and dawn.
   b. System capable of providing a visible "blink warning" five minutes prior to the end of the schedule.
   c. Entry stations may be programmed to provide timed extensions/overrides that turn the lights on for an additional time period.
      1) Timed override/extension duration programmable for each individual device, zone of devices, or customized group of devices, from five minutes to 12 hours.

6. Global Profile Capabilities:
   a. System capable of automatically modifying the sequence of operation for selected devices in response to any of the following:
      1) Time-of-day schedule.
      2) Contact closure input state.
      3) Manually triggered wired entry station input.
      4) RS-232/RS-485 command to wired input device.
      5) BACnet input command.
   b. Global Profile Capabilities:
      1) Global Profiles stored within and executed from the system controller (via internal timeclock). Dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.
      2) Global Profile time-of-day schedules capable of recurrence settings including daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control global profile schedules support definition of start date, end date, end after "n" recurrences, or never ending.
      3) Daylight savings time adjustments capable of being performed automatically, if desired.
      4) Global Profile holiday schedules follow recurrent settings for specific U.S. holiday dates regardless of if they always occur on a specific date or are determined by day/week of the month.
      5) Global Profiles capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times automatically derived from location information using an astronomical clock.
      6) Software management interface capable of displaying a graphic calendar view of profile schedules for each control zone.
      7) Global Profiles capable of manual activation directly from system controller, specially programmed wired input devices, scene-capable wired entry stations, and software management interface.
      8) Global Profiles selectable to apply to a single device, zone of devices, or customized group of devices.
      9) Global Profile Configurable Parameters:
a) Fixture light level.
b) Occupancy time delay.
c) Response to occupancy sensors (including enabling/disabling response).
d) Response to daylight sensors (including enabling/disabling response).
e) Enabling/disabling of entry stations.

c. Local and Global Profiles backed up and stored on software’s host server such that Profile backup can be applied to a replacement system controller or wired entry station.

2.03 SYSTEM SOFTWARE INTERFACES

A. Management Interface:
1. Web-based management interface for remote system control, live status monitoring, and configuration of lighting control settings and schedules.
2. Compatible with industry-standard web browser clients.
3. Minimum of 100 unique password-protected user accounts.
4. Minimum of three user permission levels: read-only, read and change settings, and full administrative system access.
5. Capable of restricting access for user accounts to specific devices within the system.
6. All system devices capable of being given user-defined names.
7. Device identification information displayed in the Management interface including:
   a. Model number.
   b. Model description.
   c. Serial number or network ID.
   d. Manufacturing date code.
   e. Custom label.
   f. Parent network device.
8. Management interface capable of displaying live status of a networked luminaire or intelligent control device including:
   a. Luminaire on/off status.
   b. Dim level.
   c. Power consumption.
   d. Device temperature.
   e. PIR occupancy sensor status.
   f. Microphonic occupancy sensor status.
   g. Remaining occupancy time delay.
   h. Photocell reading.
   i. Active Profiles.
9. Management interface capable of displaying and modifying the current active settings of a networked luminaire or intelligent control device including:
   a. Dimming trim levels.
   b. Occupancy sensor and photocell enable/disable.
   c. Occupancy sensor time delay and light level settings.
   d. Occupancy sensor response (normal or vacancy).
   e. Photocell setpoints and transition time delays.
10. Management interface capable of applying settings changes for a zone of devices or a group of selected devices using a single action that does not require the user to apply settings changes for each individual device.
11. Management interface capable of compiling a printable network inventory report.
12. Management interface capable of compiling a printable report detailing all system profiles.
13. All sensitive information stored encrypted.
14. System software updates available for automatic download and installation via the Internet.

B. System Energy Analysis and Reporting:
1. Intuitive graphical screens to facilitate simple viewing of system energy performance.
2. Energy Scorecard: Summarized display that indicates calculated energy savings in dollars or KWh.
3. Software calculates allocation of energy savings by control measures including occupancy sensors, photocells, and manual switching.
4. Energy savings data calculated for the system as a whole.
5. Time-scaled graph showing all relay transitions.
6. Time-scaled graph showing zone occupancy time delays.
7. Time-scaled graph showing the total light level.
8. Software capable of storing information remotely onto an open-source, object-relational database, such as PostgreSQL.
9. Data stored in the database will be accessed utilizing an open standard, application programming interface, such as Open Database Connectivity (ODBC).

C. Visualization and Programming Interfaces:
1. System provides an optional web-based visualization interface that displays a graphical floorplan.
2. Graphical floorplan will offer the following types of system visualization:
   a. Full Device Option: Master graphic of entire building, by floor, showing each control device installed with zones outlined including:
      1) Controls embedded light fixtures.
      2) Controls devices not embedded in light fixtures.
      3) Daylight sensors.
      4) Occupancy sensors.
      5) Wall switches and dimmers.
      6) Scene controllers.
      7) Networked relays.
      8) Wired bridges.
      9) System Controllers.
     10) Wired relay panels.
     11) Group outlines.
   b. Group-Only Option: Master graphic of the entire building, by floor, showing only control groups outlined.
   c. Pan and zoom commands supported to allow smaller areas to be displayed on a larger scale simply by panning and zooming each floor's master graphic.
   d. Selecting any control device displays the following as applicable:
      1) Device catalog number.
      2) Device name and custom label.
      3) Device diagnostic information.
      4) Link to further information on device including status or current configuration.
3. Programming capabilities through the application will include the following:
   a. Switch, occupancy sensor, and photocell zone configuration.
   b. Manual-on or automatic-on modes.
   c. Turn-on and dim to dimming levels.
   d. Occupancy sensor time delays and PIR sensitivity.
   e. Dual technology occupancy sensors sensitivity.
   f. Photocell calibration adjustment and auto-setpoint.
   g. Multiple photocell zone offset.
   h. Trim level settings.
   i. Preset scene creation and copy for scene-capable devices.
   j. Application of custom device labels to the Bluetooth Low-Energy Programming Devices and individual connected lighting control devices.
   k. Fade rate settings.

2.04 SYSTEM BACKBONE
A. Acuity Brands Lighting nLight; nECY MVOLT [BAC] [SVS] [REM] ENC GFXK
B. Multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
C. Graphical touch screen to support configuration and diagnostics.
D. Ethernet: (2) switched RJ-45 Ethernet ports.
E. Minimum of three RJ-45 networked lighting control ports for connection to graphical touch screen, wired communication bridge(s), or direct connection to networked wired luminaries and intelligent lighting control devices (up to 128 devices per port).

F. Device will automatically detect all network-connected devices. Capable of managing and operating a minimum of 750 networked devices (wired or wireless) per system controller. Multiple System Controllers capable of connection via LAN for scalability to a minimum of 20,000 networked devices.

G. Time-based control of downstream wired and wireless network devices.

H. Remotely upgradeable firmware.

I. Integral web server to support system controller configuration and diagnostics.[with control and visualization of connected devices]
   1. Web Server Control Interface:
      a. Display associated devices within the context of a graphical floorplan.
      b. Provide control of output-capable devices through virtual sliders, toggle buttons, preset level widgets, and transparent layers on floorplan.
      c. Control Capabilities:
         1) Control of individual output devices, including control of relay state and analog dimming level where applicable.
         2) Control of local lighting control zones, including control of relay state and analog dimming level where applicable.
         3) Control of global lighting control zones, including control of relay state and analog dimming level where applicable.
         4) Control of Global Profiles.

   2. Visualization Interface:
      a. Customizable display with the ability to superimpose colored, transparent layers representing real-time property values, including occupancy status, dimming level status, light level status, and online or offline status where applicable.
      b. Ad hoc display of trended information via an intuitive values-over-time graph.
      c. Report Creation:
         1) Reports accept and graphically display trended status datasets for creator selected devices or zones of devices.
         2) Report information displayed over a user-defined interval and date range.
         3) Reports exportable to a standard CSV format.

J. Supports BACnet/IP and BACnet MS/TP protocols to directly interface with BMS and HVAC equipment without additional protocol translation gateways.

K. Cellular Remote Access: Cellular router and modem for remote access.
   1. Router supports remote access to at least five system controllers on its local area network or network subnet.
   2. Remote access capable of device setting updates, schedule updates, system performance optimization, and diagnostics.
   3. Remote access enabled through outbound communication from router to an outside source. Solutions that begin communication via inbound requests for network access are unacceptable.
   4. Router supports outbound communication to manufacturer-hosted portal using TLS1.2 or greater in-transit encryption over a cellular or Ethernet connection.
   5. Router with integral firewall to prevent unauthorized access to devices connected to its local area network port.
   6. Router includes cellular SIM capable of connection to AT&T, T-Mobile, Sprint, US Cellular, Alaska Wireless, Telefonica, Tellus, Bell, or Sasktel networks where carrier service is available.
   7. Outbound communication from the router limited to whitelisted endpoints. Devices that allow unrestricted communication are unacceptable.
   8. Outbound communication from router includes only lighting control system information.
2.05 NETWORK COMMUNICATION BRIDGE
A. Acuity Brands Lighting nLight; nBRG 8.
B. Communication bridge capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. Architecture enables loss of power to a particular area to be less impactful on network lighting control system.
C. Suitable for surface mount to a standard 4 by 4-inch square junction box.
D. Communication Ports: Eight RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and system controller.
E. Power Input: Class 2 low voltage supplied locally via a directly wired power supply.

2.06 NETWORK ENTRY STATIONS
A. Acuity Brands Lighting nLight; nPODMA series.
1. See Lighting Control Device Schedule for catalog numbers.
2. Color: See Section 26 2726 “Wiring Devices” for colors.
B. Suitable for installation in single-gang switch box.
C. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
D. Devices with mechanical push buttons manufactured with custom button labeling.
E. Wall switch and dimmer options:
   1. Number of control zones: 1, 2, 4.
   2. Control types supported:
      a. On/Off.
      b. On/Off/Dimming.
      c. On/Off/Dimming/Correlated Color Temperature Control for specific luminaire types.
F. Scene controller options:
   1. Number of Scenes: 1, 2, 4
   2. Control types supported:
      a. On/Off.
      b. On/Off/Dimming.
      c. Preset Level Scene Type.
      d. On/Off/Dimming/Preset Level for Correlated Color Temperature.
      e. Reprogramming of other devices within daisy-chained zone to implement user-selected lighting scene including manual start/stop from the scene controller, or optionally programmed automatic stop after a user-selectable duration between five minutes and 12 hours.
      f. Selecting a lighting profile to be run by device’s upstream controller to implement a selected lighting profile across multiple zones including manual start/stop from the scene controller, or optionally programmed automatic stop after a user selectable duration between five minutes and 12 hours.

2.07 NETWORK GRAPHIC WALL STATIONS:
A. Acuity Brands Lighting nLight; nPOD TOUCH.
1. See Lighting Control Device Schedule for catalog numbers.
2. Color: [White] [Black].
B. Integral 3.5” capacitive full-color touch screen.
C. Suitable for installation in single-gang switch box.
D. Communication over standard low-voltage network cabling with RJ-45 connectors.
E. Power via polarity insensitive Class 2 low-voltage 15 to 24V (dc) power supply.
F. User-customizable screen saver utilizing uploaded image file in common file format.
G. Capable of configuration of all switches, dimmers, control zones, and lighting preset scenes via password-protected setup screens.
H. Graphic Wall Station Options:
   1. Number of Control Zones: Up to 16.
   2. Number of Scenes: Up to 16.
   3. Profile Scene Duration: User configurable from five minutes to 12 hours.
2.08 NETWORK AUXILIARY INPUT / OUTPUT DEVICES
A. Acuity Brands Lighting nLight; nIO series.
   1. See Lighting Control Device Schedule for catalog numbers.
B. Plenum rated.
C. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
D. Auxiliary Input/Output Devices Options:
   1. Contact closure or pull-high input.
      a. Input programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, activate lights at a preconfigured level, ramp light level up or down, or toggle lights on/off.
   2. 0-10V analog input.
      a. Input supports zero to 10 V dimming output control from a dimmer switch.
      b. Input programmable to function as a daylight sensor.
      a. Input supports activation of up to four local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
      b. Provides relay and dimming level status to external device (e.g. Touchscreen) when polled.
   4. 0-10V dimming control output, capable of sinking up to 20mA.
      a. Output programmable to support all standard sequence of operations supported by system.
   5. Outdoor Photocell Interface Kit
      a. Input supports activation of a local or remote scene over the lighting control network.

2.09 NETWORK POWER PACKS
A. Acuity Brands Lighting nLight; nPP16 series.
   1. See Lighting Control Device Schedule for catalog numbers.
B. Plenum rated.
C. Communication will be delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
D. Supply Voltage: 120 to 277 VAC
E. Relay Output: Class 1 relay rated for 16 A at 277 VAC and 1/2 HP at 120 VAC.
F. Dimming Output: 0-10 V(dc) dimming output.
G. Sink Current: 100 mA at 0-10 V(dc).
H. Mounting: Integral 1/2-inch chase nipple. Plastic clips into junction box are unacceptable.
I. Emergency Operation: Line-voltage power sensing. Devices listed as UL 924 emergency relays that automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.

2.10 NETWORK SECONDARY RELAY AND DIMMING PACKS
A. Wired networked secondary relay and dimming pack device.
   1. Acuity Brands Lighting nLight; nSP5 series.
   2. See Lighting Control Device Schedule for catalog numbers.
B. Plenum rated.
C. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
D. Mounting: Integral 1/2-inch chase nipple. Plastic clips into junction box are unacceptable.
E. Relay Output: Class 1 latching relay.
F. Output Ratings:
   1. Two wire dimming (2W): 1375 W at 277 VAC and 575 W at 120 VAC. 7 W minimum load.
   2. Three wire dimming (3W): 1375 W at 277 VAC and 575 W at 120 VAC. 7 W minimum load.
   3. Magnetic low voltage (MLV): 1375 W at 277 VAC and 575 W at 120 VAC. 7 W minimum load.
   4. Electronic low voltage (ELV): 475 W at 120 VAC. No minimum load. 120 VAC only.
2.11 NETWORK RELAY PANELS
A. Acuity Brands Lighting nLight; ARP series.
   1. See Lighting Control Device and Relay Panel Schedule(s) for requirements.
   2. Provide all required voltage barriers to separate emergency relays and mixed voltages.
B. Outputs: 4, 8, 12, 16, 24, 32, 40, 48 individual relays per panel, with an equal number of
   individual 0-10 V(dc) dimming outputs.
C. Field Configurable Relays (FCR):
   1. Field configurable to operate in single-, double-, or triple-pole relay groupings.
   2. Field configurable to operate as normally closed or normally open.
   3. Provides visual status of current state and manual override control of each relay.
   4. Minimum Relay Contact Ratings:
      a. 40 A at 120-480 VAC Ballast.
      b. 16 A at 120-277 VAC Electronic.
      c. 20 A at 120-277 VAC Tungsten.
      d. 20 A at 48V (dc) Resistive.
      e. 2 HP at 120 VAC.
      f. 3 HP at 240-277 VAC.
      g. 65kA SCCR at 480 VAC.
D. Dimming Output Rating: Minimum of 100 mA sink current per dimming output.
E. Relay and dimming outputs individually programmable.
F. Integrated 120-277 VAC power supply.
G. Enclosure:
   3. Cover: Hinged cover with keyed lock.
H. Low-Voltage Sensor Input:
   1. Configurable to support any of the following input types:
      a. Indoor Photocell.
      b. Outdoor Photocell.
      c. Occupancy Sensor.
      d. Contact Closure.
   2. Low-voltage sensor input provides 24 V(dc) power for sensor so additional auxiliary power
      supplies are not required.
   3. Sensor input supports all standard sequence of operations.
I. [Integrated Digital Time Clock for local schedule control.]
J. [Contact Closure Input: One for each group of eight output relays that acts as a panel override
   to activate the normally configured state of all associated relays (i.e., normally open or normally
   closed).]
K. Emergency operation: Line-voltage power sensing from the internal power supply. Devices
   listed as UL 924. The power supply provides a low voltage (Class 2) brownout sense signal;
   the relay controller board senses that signal, all relays are turned on and 0-10V outputs are set
   to maximum.

2.12 NETWORK OCCUPANCY SENSORS AND PHOTOCELLS
A. Acuity Brands Lighting nLight; nCM, nWV, nHW series.
   1. See Lighting Control Device Schedule for catalog numbers.
   2. Ceiling mount occupancy sensors include one integrated dry contact switching
      relay, capable of switching 1 A at 24 V, resistive only.
3. Color: White, unless noted otherwise.
B. Detect the presence of human activity within space and fully control the on/off function of lights.
C. Passive Dual Technology: Infrared and microphonic sensors integrated into one housing.
D. Performance and Coverage: Passive Infrared (PIR) shall engage sensor and PIR or
   microphonic shall detect continued occupancy. 360-degree field of view. Minimum coverage of
   20-foot radius at 9’ mounting height, with sensor centered in coverage area.
E. Mounting: Sensor shall flush horizontal mount tight to ceiling surface. Sensors that protrude from ceiling or utilize drop-down mounting brackets shall not be acceptable.

F. Ceiling, fixture, recessed, and corner mounted sensors available, with multiple lens options available customized for specific applications.

G. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.

H. Photocell/daylight override, automatic dimming control, and low temperature/high humidity operation.

I. Photocell and dimming sensor’s set-point and dead band automatically calibrated through the sensor’s microprocessor by initiating an “Automatic Set-Point Programming” procedure. Min and max dim settings as well as set-point may be manually entered or modified.

J. Dual zone option available for photocell. The secondary daylight zone capable of being controlled as an “offset” from the primary zone.

2.13 NETWORK WALL SWITCH SENSORS
A. Acuity Brands Lighting nLight; nWSXA series.
1. See Lighting Control Device Schedule for catalog numbers.
2. Color: See Section 26 2726 “Wiring Devices” for colors.

B. Detect the presence of human activity within space and fully control the on/off function of lights.

C. Passive Dual Technology: Infrared and microphonic sensors integrated into one housing.

D. Performance and Coverage: Passive Infrared (PIR) shall engage sensor and PIR or microphonic shall detect continued occupancy. 180-degree field of view. Capable of sensing small motion up to 20 feet at 4' mounting height.

E. Suitable for installation in single-gang switch box.

F. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.

2.14 LINE VOLTAGE WALL SWITCH SENSORS
A. Acuity Brands Sensor Switch; WSXA PDT, WSXA PDT D
1. Finish: Coordinate finish of devices with section 26 2726 “Wiring Devices”.

B. Passive Dual Technology: Infrared and microphonic sensors integrated into one housing.

C. Performance and Coverage: Passive Infrared (PIR) shall engage sensor and PIR or microphonic shall detect continued occupancy. 180-degree field of view. Capable of sensing small motion up to 20’ at 4’ mounting height.

D. Suitable for installation in single-gang switch box.

E. On Modes
1. Automatic on - Sensor turns load on based on sensing occupancy of monitored area.
3. Automatic on at 5VDC – Sensor turns load dimmed to 50% based on sensing occupancy of monitored area.

F. Switch Off Modes
1. Predictive off mode - Occupant can turn lights off manually, or lights automatically turn off after time out period. If lights are manually turned off, the sensor shall revert to automatic on after sensor sees no motion during time out period.
2. Permanent off mode - Pressing the switch turns the lights off. Lights will not turn on until switch is pressed again.
3. Switch disable - Prevents user from manually turning lights off.

G. Load Rating: Switch integral in sensor housing
1. Rated for 800-watt ballast or incandescent load at 120 VAC.
2. Rated for 1200-watt ballast load at 277 VAC.
3. Rated for ¼ horsepower motor load at 120/277 VAC.

H. Dimming Output: 0-10 V(dc) dimming output.

I. Sink Current: 50 mA at 0-10 V(dc).

2.15 LINE VOLTAGE WALL BOX DIMMERS
A. Commercial grade Lutron Nova T Series Dimmer or approved equal.
1. Finish: Coordinate finish of devices with section 26 2726 “Wiring Devices”.

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B. Slider with preset suitable for operation of connected load.
C. Match connected loads (forward phase, reverse phase, 3-wire, 0-10v, etc.).
D. Capacity as indicated on the drawings. Observe derating restrictions for ganged devices.
E. Provides multi-location capability using standard 3-way and 4-way mechanical switches.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Comply with NECA 1.
B. It shall be the intent of these specifications and plans to include all components required for the proper and complete installation and operation of the lighting control system. Provide all required components to meet design intent, including any additional components requirements for alternate equipment. This shall be coordinated by the lighting control system supplier with the Electrical Contractor.
C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
D. Stand-alone lighting controls:
   1. Provide required power packs as required to control intended groups of lights. Connect power packs per manufacturer’s instructions.
   2. Adjust settings of occupancy sensors tailored to configuration and use of room served.
E. Networked lighting controls:
   1. Locate all power packs above accessible ceilings near fixtures being controlled. In exposed structure areas, locate device in junction box and paint to match surroundings.
   2. Daisy-chain all network lighting control devices to network bridge devices per manufacturer’s recommendations. Provide quantity of bridges such that each room/space is a separate lighting control zone that appears in programming software.
   3. Identify all controls with device address and label each device cable within 6 inches of connection to bus power supply or termination block.
   4. After construction, the Electrical Contractor shall provide the Owner a record drawing set detailing the locations of all control devices located above ceilings and the luminaire or groups of luminaires being controlled by each device.
F. Conductors and Cabling:
   1. Provide plenum-rated, pre-terminated cabling as manufactured by lighting control manufacturer for all lighting control network cables shorter than 50 feet. Cables shall be as short as practical with a minimum 10’ length. Cables longer than 50 feet shall be terminated by a low-voltage technician or qualified contractor.
   2. Provide white cable color for all lighting control network cabling.
   3. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer’s limitations on bending radii. Install lacing bars and distribution spools.
   4. Provide J-Hook supports for lighting control network cabling located above accessible ceilings. Route cabling in conduit at all other locations.
   5. Provide 600V rated [shielded pair] control wiring to all luminaires served by 0-10v dimming relays and control devices. Route control wiring in separate conduit[ and ground cable shield to earth at the control device].
      a. #18 AWG for runs up to 300 feet.
      b. #16 AWG for runs between 300 feet and 400 feet.

3.02 FIELD QUALITY CONTROL
A. Tests: As follows:
   1. Verify normal operation of each lighting control per lighting control sequence of operations.
B. Malfunctioning Lighting Controls: Replace or repair, then retest. Repeat procedure until units operate properly.
C. Prepare test and inspection reports.

3.03 [REMOTE ACCESS]
A. Digital network lighting control system capable of remote access by manufacturer with the following features:
1. System diagnostics including detection of fault condition in hardware or connected devices.
2. Access to all connected devices for complete programming including scheduling of time-of-day events and device parameters necessary to meet required sequence of operations.
3. Browser-based interface to verify system functionality.
4. On-demand access to manufacturer technical support for remote troubleshooting, diagnostics, configuration, and programming.
5. Owner training on the digital network lighting control system available remotely.

B. Remote access system fully functional over commercial cellular connection or Internet-connected ethernet network.
C. All hardware associated with remote access including cellular modem and cellular antenna are to remain on-site regardless of warranty or cellular contract status.

3.04 SYSTEM STARTUP
A. Engage a factory-authorized service representative to perform startup service.
B. Complete installation and startup checks in accordance with manufacturer's published instructions.
C. Activate luminaires and verify that all maximum output levels match output levels detailed in an Owner-approved sequence of operations.
D. Confirm correct communications wiring, initiate communications between control devices and controller/gateways, and program the lighting control system in accordance with approved configuration schedules, time-of-day schedules, and input override assignments.
E. Program network devices to meet required sequence of operations.
F. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
G. For daylighting controls, adjust set points and dead band controls to suit Owner's operations.
H. Create backup of system programming.
I. Assist in installation of system software on customer-provided workstation or server.
J. Verify text for entry station button engravings with Owner.
K. [Verify bidirectional communication of manufacturer-provided cellular router with manufacturer-managed remote access portal.]
L. Commissioning Walkthrough: [Engage factory-authorized service representative to collaborate with third-party commissioning agent] [Collaborate with third-party commissioning agent] to demonstrate lighting control system functionality and verify the system meets the specified Project requirements.

3.05 [AV INTEGRATION
A. The lighting control system shall be integrated with the AV solutions as specified in DIV.27.
B. Contractor shall provide RS-232 connections as required for the lighting control system to connect to the AV system.
C. Provide all required programming for lighting control system to interface with audio visual system.
D. The following commands shall be available to the AV system:
   1. On/Off and Raise/Lower/Go-to-level dimming
   2. Global and Local Profile activation
   3. Scene preset recalls
E. Provide necessary coordination labor for integration of all AV commands listed hereto before.

3.06 [BMS INTEGRATION
A. The lighting control system shall be integrated with the BMS solutions as specified in DIV.23.
B. Contractor shall provide network connections as required for the lighting control system to connect to the BMS.
C. Provide all required programming for lighting control system to interface with the BMS.
D. The following system integration capabilities shall be provided:
   1. "Read" messages for group status information for occupancy state in each room.
   2. Activation of pre-defined system Global Profiles for scheduling.
3.07 CLOSEOUT ACTIVITIES
A. Enhanced Documentation: Engage lighting system manufacturer to provide comprehensive system documentation including detailed programming, sequence of operation data per Project specifications, and related code requirements.
B. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control system and devices. Training shall be video recorded by contractor.
C. Install engraved buttons for entry stations per the sequence of operations specified herein. At the request of Owner provide additional engraved buttons based on desired changes to text.

3.08 MAINTENANCE
A. Engage a factory-authorized service representative to perform on-site system adjustments.
   1. On-Site Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site settings adjustments to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
   2. Prepare and submit report after each visit that details activities performed
B. [Engage a factory-authorized service representative to perform remote system adjustments.]
   1. Remote Occupancy Adjustments: When requested within 12 months from date of Substantial Completion and project registration with lighting control system manufacturer, provide remote settings adjustments to suit actual occupied conditions. Provide up to [5] sessions to Project during other-than-normal occupancy hours for this purpose.
      a. System to include manufacturer-provided cellular communication hardware and connection to the system for a minimum of 12 months after substantial completion to allow for factory representative assistance with settings adjustments and system sustainment.
      b. For the remaining duration of the maintenance term, or in the event cellular connectivity is not available, manufacturer assistance must be available through an Owner-provided, Internet-connected network.

3.09 SEQUENCE OF OPERATION
A. Building Time Schedule:
   1. Business Hours: [6am until 6pm]
   2. After Hours: [11pm until 6am]
   3. Exterior Lighting Curfew: [12am]
B. Exterior Lighting:
   1. Dusk to Curfew: Lights on at 100% output.
   2. Curfew to Dawn: Motion sensor dimming to 10% via wireless controls. Wirelessly “group” luminaires so that all luminaires in area are controlled together.
   3. Daytime hours (dawn to dusk): Override on via outdoor photocell.
C. Typical Enclosed Office
   1. Design Light Level: 40fc
   2. Time Out Periods:
      a. Business Hours: 15 minutes
      b. After Hours: 5 minutes
   3. Wall switch occupancy sensor or Entry Station 1PD:
      a. Button 1: On/Off
      b. Button 2: All lights up
      c. Button 3: All lights down
   4. Room Function Description:
      a. Sensor shall operate as a vacancy sensor. Occupant presses button 1 and lights illuminate to 30fc. Button 2 increases light levels to a maximum of 40fc. Button 3 dims lighting to minimum. Pressing button 1 a second time turns lights off. If no movement is sensed for time out period lights turn off.
D. Typical Classroom
1. Design Light Level: 40fc
2. Time Out Periods:
   a. Business Hours: 15 minutes
   b. After Hours: 5 minutes
3. Entry Station 2S at entry:
   a. Button 1: 75% - Adjusts lighting to 30fc at work plane 30fc at marker board
   b. Button 2: Off
4. Entry Station 4SD at teaching location:
   a. Button 1: 100% - Adjusts lighting to 40fc at work plane 30fc at marker board
   b. Button 2: 50% - Adjusts lighting to 20fc at work plane 30fc at marker board
   c. Button 3: A/V - Turns off marker board light Dims all other lights to 5fc
   d. Button 4: Off - Turns all lights off
   e. Button 5: 75% - Adjusts lighting to 30fc at work plane 30fc at marker board
   f. Button 6: 25% - Adjusts lighting to 10fc at work plane 20fc at marker board
   g. Button 7: Up - Uniformly raises all lights. Maximum of 40fc
   h. Button 8: Down - Uniformly lowers all lights.
5. Room Function Description:
   a. Sensor shall function as a vacancy sensor. Vacancy sensor shall turn off all lights after timeout period. Where daylight zones are indicated on plan photocell shall automatically maintain specified light level by dimming lights within daylight zone when daylight is available.

E. Typical Storage Room
1. Room Function Description:
   a. Lights shall illuminate upon detection of occupancy. If no movement is detected for 5 minutes the lights shall turn off.

F. Typical Corridor
1. Design Light Level: 20fc
2. Time Out Periods:
   a. Business Hours: 15 minutes
   b. After Hours: 5 minutes
3. Room Function Description:
   a. During business hours lights shall not turn off, lights shall dim to minimum after time out period. All other hours lights shall illuminate upon detection of occupany. If no movement is detected for time out period the lights shall turn off.

G. Typical Public Restroom
1. Design Light Level: 20fc
2. Time Out Periods:
   a. Business Hours: 15 minutes
   b. After Hours: 5 minutes
3. Room Function Description:
a. During business hours lights shall not turn off, lights shall dim to minimum after time out period. All other hours lights shall illuminate upon detection of occupancy. If no movement is detected for time out period the lights shall turn off.

H. Typical Small Restroom (Single Fixture)
1. Design Light Level: 20fc
2. Room Function Description:
   a. Lights shall illuminate upon detection of occupancy by wall switch occupancy sensor. If no movement is detected for 10 minutes the lights shall turn off.

I. Typical Conference Room
1. Design Light Level: 40fc
2. Time Out Periods:
   a. Business Hours: 15 minutes
   b. After Hours: 5 minutes
3. Entry Station 4SD:
   a. Button 1: 100% - Adjusts lighting to 40fc at work plane
   b. Button 2: 50% - Adjusts lighting to 20fc at work plane
   c. Button 3: A/V - Turns row of lights closest to A/V display off Dims all other lights to 5fc
   d. Button 4: Off - Turns all lights off
   e. Button 5: 75% - Adjusts lighting to 30fc at work plane
   f. Button 6: 25% - Adjusts lighting to 10fc at work plane
   g. Button 7: Up - Uniformly raises all lights.
   h. Button 8: Down - Uniformly lowers all lights.
4. Room Function Description:
   a. Sensor shall function as a vacancy sensor. Vacancy sensor shall turn off all lights after timeout period. Where daylight zones are indicated on plan photocell shall automatically maintain specified light level by dimming lights within daylight zone when daylight is available.

END OF SECTION
COMMUNICATIONS
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SECTION 27 1500
TELECOMMUNICATIONS CABLING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and request for proposal front end documents, apply to this Section.

1.02 SUMMARY
A. This Section includes pathways for telecommunications as indicated on the drawings.
B. This Section includes cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for high-speed data transmission. Unless otherwise indicated, copper systems shall be Systimax Category 6A, certified and warranted.

1.03 PRICING INFORMATION
A. The Owner receives a 25% volume discount on Systimax cabling. Reference Omaha Public Schools as the project Owner when obtaining pricing.

1.04 WARRANTY
A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Special Warranty: 25-year for voice/data system, Systimax certified system.
C. The SYSTIMAX warranty shall be provided by a company that is headquartered within a 50-mile radius of Omaha, NE.

1.05 DEFINITIONS
A. EMI: Electromagnetic interference.
B. IDC: Insulation displacement connector.
C. LAN: Local area network.
D. PVC: Polyvinyl chloride.
E. STP: Shielded twisted pair.
F. UTP: Unshielded twisted pair.
G. EMT: Electrical Metallic Tubing
H. FMC: Flexible Metal Conduit

1.06 SUBMITTALS
A. Product Data: Include data on features, ratings, and performance for each component specified.
   1. Cables / Fibers
   2. Patch cords
   3. Patch panels
   4. Outlets/Jacks/Faceplates
   5. Adaptors
   6. Mounting elements
   7. Racks
   8. Cable management products
B. Shop Drawings: Include dimensioned plan and elevation views of components. Show access and workspace requirements.
   1. Equipment rack layout, including space for future equipment
   2. Communication closet arrangement
   3. Cable numbering scheme explanation. All numbering and identification schemes shall follow latest published OPS standards. Standards document is available upon request.
   4. Floor plans indicating cable number(s) for each outlet. AutoCAD drawing files will be available in accordance with general requirements of this specification for the contractor’s use in preparing floor plans.
C. Product Certificates: Signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.
D. Electronic copies of certification and test reports on CD.
E. Maintenance Data: For products to include in maintenance manuals specified in Division 1.
F. Special Warranty: Certificate signed by Systimax manufacturer activating 25-year warranty for telecommunications systems.

1.07 QUALITY ASSURANCE
A. Installer Qualifications: An experienced and approved Systimax certified installer who is a registered communication distribution designer certified by the Building Industry Consulting Service International.
B. Installer must have the manufacturers recommended number of employees on the job site who have completed the required training course for the above-mentioned warranties. Installer must maintain current status with the warranting manufacturer for the duration of the project.
C. Comply with NFPA 70.
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
E. Comply with all applicable EIA/TIA Standards for telecommunications cabling, pathways, performance testing, grounding, and administrative standards.

1.08 COORDINATION
A. Coordinate Work of this Section with Owner's LAN active equipment.
   1. Meet with Owner’s representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
   2. Record agreements reached in meetings and distribute record to other participants.
   3. Adjust arrangements and locations of distribution frames, patch panels, and cross connects in equipment rooms, wiring closets, and racks to accommodate and optimize arrangement and space requirements of LAN equipment.
B. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
C. Only MAJOR conduit sleeves and penetrations are shown on the drawings. The contractor shall provide all additional sleeves, penetrations, and conduit stubs through walls, floors, and other spaces as required to accommodate all cabling.
D. Coordinate phasing of cutover with Owner’s representative(s) including network rack moves, network equipment moves, network outages, etc.

PART 2 - PRODUCTS
2.01 SYSTEM REQUIREMENTS
A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum performance.

2.02 PATHWAYS
A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard
B. Interior concealed telecommunications pathways: EMT, FMC only where indicated, cable duct, and cable tray
C. Interior exposed telecommunications pathways: EMT or surface metal wiremold as indicated on Drawings or as selected by Engineer. Make every attempt to conceal and recess pathways in existing building construction, interior exposed pathways shall be allowed by special permission only.
D. Within Telecommunications Closets or Areas: Provide hardware, cable tray, racks, ground bars, mounting plywood, and wire management.
E. Ladder Cable Management Tray (Communications Rooms)
   1. Manufacturers: Equipment listed in this specification shall be the standard product of Chatsworth Products Inc. whose catalog and model numbers are used to identify the type and quality of design, materials used, and features required.
      a. Equal equipment as manufactured by Systimax may be considered as acceptable.
   2. Ladder Cable Management Tray:
a. Nominal Dimensions: Rung spacing shall not exceed 12”
   Material: Welded steel, painted finish
b. Straight Section: CPI series 10250-X**
c. Corner Bend: CPI series 10822-X**
d. Corner Bracket (15”): CPI part no. 11959-X15
e. Wall Angle Support Kit: CPI series 11421-7**
f. Triangular Support Bracket: CPI series 11746-7**
g. 6” Radius Drop Outs: CPI part no. 12100-X06
h. Runway Dividers: 13392-7**
i. End closing kit: CPI series 11700-7**
j. Splice Kits: CPI series 11301/2-001

3. Support system: Provide additional support devices as required per manufacturer’s recommendations. Supports shall consist of threaded rods with associated fittings and/or wall brackets. Wall brackets shall be factory assemblies by cable tray manufacturer.

4. Grounding: Provide grounding lugs for attachment of ground conductor to tray.

5. Horizontal transition pieces (90s, 45s, etc.) shall be factory manufactured assemblies and shall not be cut and bent from straight runs.

F. Non-Continuous Cable Support:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
      a. Erico/Caddy
      b. Cooper/B-line
      c. Panduit Corp.
   2. NRTL labeled for support of UTP cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   3. Lacing bars, spools, and D-rings should only be used in the EFs, TRs and ERs.
   4. J-hooks and or adjustable cable supports (also called slings) shall be used in any ceiling space where cable tray is not available.

2.03 HORIZONTAL DATA CABLES
A. Systimax Gigaspeed X10D 2091
   1. Category 6A
   2. Plenum rated for indoor use. Outside plant rated where exposed outdoors, underground, or similar environments.
   3. Type: Unshielded Twisted Pair (UTP), UL Listed
   4. Blue Jacket (indoor), Black jacket (outdoor)

2.04 OUTLETS
A. Faceplates:
   1. Size: Single gang, unless otherwise indicated
   2. Outlet positions: Configurations as indicated on Drawings
   3. Fillers: As required for unused jack openings
   5. Systimax modular faceplate series suitable for M Series connectors (M14L-246)
B. Data Jacks:
   1. Gigaspeed X10D MGS600 Series
   2. Mounting: In modular face plate
   4. Color: Blue
   5. Category 6A, RJ 45, 568 B pin-out configuration
   6. Blue jack insert identification
   7. Data icon accessory
   8. Verify jack type and configuration with Owners equipment

2.05 COPPER PATCH PANELS
A. Systimax P/N 360-PM-GS6-XX-XX
   1. Quantity: As required for termination of each cable plus 50% spare capacity

2.06 PATCH CORDS
A. Data patch cords
1. Systimax Gigaspeed X10D patch cords, Category 6A, Lt blue color. PN CPCSSX5-0X
2. Factory made, four-pair, stranded
3. Quantities as follows: For each data cable = 100% one foot, 50% five foot, 50% ten foot
(example, 100 data cables = 100 one foot, 50 five foot, 50 ten foot).

2.07 MOUNTING ELEMENTS
A. Backboards: 3/4-inch, A/C rated, interior-grade, with stamp visible, fire-retardant-treated plywood painted with fire-retardant white paint.
B. Distribution Racks: Freestanding and wall-mounting, aluminum units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
1. Approximate Rack Dimensions: 84 inches high by 22 inches wide.
2. Finish: Black powder coat
3. Freestanding Racks.
   a. Configuration: Standard TIA 19"
   b. Height: 84 inches
   c. 6 inch Channel Post
   d. One shelf (CPI #40751-719 or approved equivalent)
   e. One Power Strip (Geist BR100-15 or approved equivalent)
   f. One Tripplite SmartOnline UPS 1500 or 2200 with SNMP WEB card
C. Equipment Rack Vertical Cable Management: CommScope VCM-DS-84-6 760072785
D. Equipment Rack Horizontal Cable Management: CommScope HTK-19-SS-2U 760072959
E. Distribution Rings
1. Wall mounted 6” D rings suitable for Cat 6 cables.
F. Telecommunications Cable Loop Hangers
1. Plenum rated plastic loop with support wire to structure
2. Size as required for supported cables, minimum 2” diameter
3. Arlington Industries TL series or approved equivalent
G. Cable Bundling Hardware
1. Reusable Velcro cable ties

2.08 OPTICAL FIBER CABLE
A. Systimax P/N D-0XX-LN-8W-F12NS
1. Singlemode fiber, strand count as indicated on drawings
2. Outside Plant Rated
3. Non-armored
4. Black jacket color

2.09 OPTICAL FIBER CABLE HARDWARE
A. Fiber Patch Panel: P/N HD-1U
1. Mounting: Rack mount.
2. Provide Systimax Splice Cassette: P/N G2-SP-12LCG-PT, Coordinate exact cartridge with owner.
B. Fiber Connectors: LC style to match cartridges.
C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
1. Provide One patch cord for each fiber pair.

2.10 IDENTIFICATION PRODUCTS
A. Comply with EIA/TIA Standards.
1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

PART 3 - EXECUTION
3.01 EXAMINATION
A. Examine pathway elements intended for cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installa
tion, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Wiring Method:
   1. Install all wiring in conduit. Conceal conduit within structure. Wiring above lay-in type ceilings shall be permitted to be supported with communications loop hangers every 4’-0” on center or installed in cable tray in lieu of conduit.

B. Install interior telephone and signal system raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

C. Utilize sweep elbows for all telephone and signal system raceways.

D. Install cable using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6A performance for data outlets.

E. Install cable without damaging conductors, shield, or jacket.

F. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.

G. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
   1. Pull cables simultaneously if more than one is being installed in the same raceway.
   2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
   3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage media or raceway.

H. Install cable parallel and perpendicular to building surfaces and structural members.

I. Secure and support cable not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals. Provide necessary J-hooks and D-rings.

J. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

K. Separation of Wires: Comply with EIA/TIA-569 rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.

L. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

M. Use splice and tap connectors compatible with media types.

3.03 GROUNDING

A. Grounding shall conform to ANSI/TIA/EIA 607 (A) - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code, ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum.

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Ground racks, ladder trays, and cable ducts.

3.04 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Group connecting hardware for cables into separate logical fields.

B. Use patch panels to terminate cables entering the space.

C. Install radi used waterfall dropout fitting from cable trays above each rack location.

D. Provide service loop in tray, 10' minimum on closet end.

3.05 JACK INSTALLATION

A. Install filler plug for each unused faceplate opening.

B. Terminate wire in 568B pin configuration.

3.06 STATION CABLE INSTALLATION

A. Provide quantities of horizontal cables indicated from telecommunications closet to station outlet. Cables shall not be spliced.
B. Install cables in and through pathways furnished as specified in EIA/TIA – 569.
C. Run cables parallel to building structure.
D. Provide D ring, J-hook, and cable loop supports at backboards and where required from cable tray to conduit drop.
E. Provide service loop at each station outlet. Service loop shall be concealed above accessible ceiling, 10” nominal diameter with fastener, 24” slack minimum.

3.07 IDENTIFICATION
A. Identify system components complying with applicable requirements of EIA/TIA.
B. Workstation: Label cables within outlet boxes.
C. Distribution Racks and Frames: Label each unit and field within that unit.
D. Ground bar: Label each unit.
E. Within Connector Fields, in Wiring Closets and Equipment Rooms: Label each connector and each discrete unit of cable-terminating and connecting hardware.
F. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
G. Cable Schedule: Post in prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Provide electronic copy of final comprehensive schedules for Project on CD to Owner.
H. All labeling nomenclature shall comply with latest published OPS standards, available upon request. Submit proposed labeling scheme for approval prior to installation.

3.08 PERFORMANCE REQUIREMENTS
A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.
B. Tests and Inspections:
   1. Visually inspect UTP and or optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
   2. Visually confirm marking of outlets, cover plates, outlet/connectors, and patch panels.
   3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
      a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
   5. Optical Fiber Cable Tests:
      a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
      b. Link End-to-End Attenuation Tests:
         1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
         2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
   6. UTP Performance Tests:
      a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
         1) Wire map.

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2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.

3.09 FIELD QUALITY CONTROL
A. Testing: On installation of cable and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
1. Certify all cable performance in accordance with industry standards. Provide a report that indicates all cable lengths, attenuations, and near end cross talks.
B. Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
C. Provide warranty certificate, manufacturer’s 25 year for voice data system.
D. Provide electronic copy of all test information and as built drawings.

3.10 CLEANING
A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.11 RECORD DRAWINGS
A. Maintain current documents at the construction site. Submit with Operation and Maintenance manuals.
B. Record drawings shall include all information required for shop drawings and in addition, shall indicate the following:
1. Routing of cables from communications closets to jacks.
2. Revisions to construction documents (addenda and field changes).

END OF SECTION
PART 1 - GENERAL

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

1.02 SUMMARY
A. This Section includes audio visual systems indicated on the construction drawings including but not limited to:
   1. Relocation and reconnection of existing AV equipment
   2. Audio Visual Cabling, faceplates, connectors
   3. AV Components including A/V Controllers, touch screens
B. AV contractor shall maintain a local service presence for the duration of the warranty period. Local service presence shall be within 90 miles of project site.

1.03 SUBMITTALS
A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories.
B. Shop Drawings:
   1. Wiring Diagrams: For power, signal, and control wiring.
C. Field quality-control test reports.
D. Operation and Maintenance Data: For audio visual equipment and components to include in maintenance manuals specified in Division 1. In addition to items specified in Division 01 Section "Operation and Maintenance Data" include the following:
   1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
   2. System installation and setup guides, with data forms to plan and record options and setup decisions.
E. Warranty documents for equipment.
F. As-Built Drawings upon completion of project.

1.04 QUALITY ASSURANCE
A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with NFPA 70, "National Electrical Code."
D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

1.05 WARRANTY
A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of audio/visual systems and equipment that fail in materials or workmanship within specified warranty period.
   1. Warranty Period (standard AV equipment): One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PATHWAYS
A. General Requirements: Comply with TIA/EIA-569-A/B.
B. Types of pathways:
   1. Non-Continuous Cable Support:
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
         1) Erico/Caddy
         2) Cooper/B-line
         3) Panduit Corp.
b. NRTL labeled for support of UTP cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

c. J-hooks and or adjustable cable supports (also called slings) shall be used.

2.02 MANUFACTURERS / PRODUCTS
A. Refer to plans for acceptable manufacturers and product data. All part numbers shown represent current equipment available at time of bid. Should any piece of equipment become unavailable or be replaced by a different model number, the contractor shall provide the current model at time of order or an equal replacement at no additional cost to the project.

B. All cabling shall be plenum rated unless otherwise indicated.
C. Drawings indicate major AV system components. Provide products complete with all accessories, power supplies, misc. devices, connectors, etc. as needed for a complete and operational system for the intended use and effect.
D. Provide faceplates for AV input devices where exposed. Faceplates shall match adjacent electrical wiring devices for material and finish at all locations.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

3.02 SYSTEM SETUP
A. System setup shall include the following:
1. Relocate all existing devices noted on construction documents. Relocate all components indicated as required to maintain current operation of all audio-visual systems including but not limited to microphone systems, LED video scoreboard controllers, touch panels, etc. Provide any additional cabling as required to accommodate relocation of devices.

3.03 CABLING
A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces. In exposed structure areas, route conduit tight to structure. Conduit shall be routed parallel and perpendicular to structure in a neat manner. Exposed cabling of any type shall not be allowed.
B. General Cable Installation Requirements:
  1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
  2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
  3. Secure and support cables at intervals not exceeding 48 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
  5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

3.04 GROUNDING
A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."
B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."
C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
D. Bond shields and drain conductors to ground at only one point in each circuit.

3.05 IDENTIFICATION
A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and with TIA/EIA-606.
B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.
C. At completion, cable and asset management software shall reflect as-built conditions.

3.06 SYSTEM SOFTWARE
A. Develop, install, and test software and databases for the complete and proper operation of systems involved. Install software on owner-designated workstations. Assign software license to Owner.
B. All programming code for AV system components (controllers, touch screens, audio DSPs, etc.) shall be turned over to owner after programming, commissioning, and setup of system is complete.

3.07 FIRESTOPPING
A. Comply with TIA/EIA-569-A; Annex A, "Firestopping."
B. Select appropriate type or types of through penetration firestop devices or systems appropriate for each type of communications penetration and base each selection on criteria specified herein.
1. Use firestop devices for all wall, floor, and roof penetrations.
2. Putty or caulk is only to be used on small penetrations.
C. Selected systems shall not be less than the hourly time delay ratings indicated in the Contract Documents for each respective fire-rated floor, wall, or other partition of building construction. Firestop for each type of communications penetration shall conform to requirements of an independent testing laboratory design drawing or manufacturer's approved modification when used in conjunction with details shown on the Drawings.
D. Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction with respect to size and shape of each opening to be constructed and device or system approved for use in each instance.

3.08 FIELD QUALITY CONTROL
A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections.
B. Testing Agency: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports:
C. Remove and replace malfunctioning devices and circuits and retest as specified above.

3.09 STARTUP SERVICE
A. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks.

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AND SECURITY
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SECTION 28 1300
ACCESS CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Access control system shall be integrated with monitoring and control system specified in Division 28 Section "Integrated Security System" that specifies systems integration.

1.02 SUMMARY

A. This Section includes pathways and devices for an access control system as indicated on the drawings including but not limited to:
   1. Card readers, door contacts, request-to-exit motion sensors, door controllers, power supplies, and network interface devices.
   2. Select Pathways for cabling
   3. Conductors and cabling
   4. Access Control System Licenses

B. Servers and software are existing. New devices shall be seamlessly integrated into existing building system.

C. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

D. Related Sections include the following:
   1. Division 08 Section "Door Hardware" for door hardware and access control device information and architectural drawings.
   2. Division 26 Section "Basic Electrical Materials and Methods" for raceway information.

1.03 DEFINITIONS

A. Main Server: A PC with software designated as the main controlling PC of the security access system. Where this term is presented with initial capital letters, this definition applies.

B. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.

C. Credential: A physical medium used to associate a person with an access level.

D. Location: A Location on the network having a PC-to-Controller communications link, with additional Controllers at the Location connected to the PC-to-Controller link with RS-485 communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. Workstation: A PC with software that is configured for specific limited security system functions.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:
   1. System components including devices and cabling.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Qualifications Data: For installer / technician, installation supervisor and field inspector.

D. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data" include the following:
   1. Software documentation.
   2. Hard copies of manufacturer’s specification sheets, operating specifications, design guides, user’s guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
   3. System installation and setup guides, with data forms to plan and record options and setup decisions.

E. As-Built Drawings upon completion of project.
F. Test results
G. Warranty Information

1.05 QUALITY INSURANCE
A. Installer Qualifications: Contractor shall have at least 5 years’ experience in the field. Each installer/technician, installation supervisor, and field inspector shall be a certified installer of the system manufacturer. The contractor shall provide at least five references for projects of similar scope and specifications.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Grounding: Comply with ANSI-J-STD-607-A/B.
D. Comply with all applicable ANSI/TIA/EIA 568-C and BICSI standards / guidelines for telecommunications cabling, pathways, performance testing, and administration.

1.06 WARRANTY
A. Equipment shall be warranted against any defects in material and from the date of acceptance by the owner. The owner shall deem acceptance as beneficial use. In the event any part of the system is found by manufacturer to be defective within the warranty period, the manufacturer shall repair and/or replace any defective parts.
1. Warranty Period: One year from the date of owner acceptance.

1.07 SYSTEM DESCRIPTION
A. The access Control System shall consist of the following:
1. Door Controllers
2. Card Readers
3. Door position switches
4. Request-to-exit sensors
5. Interface to Door locking devices (electric strikes, electronic lock sets, etc.)

1.08 PERFORMANCE REQUIREMENTS
A. Door Hardware Interface: Coordinate with Division 08 Sections that specify door hardware required to be monitored or controlled by the security access system. The Controllers in this Section shall have electrical characteristics that match the signal and power requirements of door hardware. Integrate door hardware specified in Division 08 Sections to function with the door controllers and power supplies furnished and installed as part of this section.
1. Scope of work distribution is as follows:
   a. Division 8 to prepare doors and mount all access control hardware furnished with division 8 equipment.
   b. Security contractor to test all door hardware and coordinate troubleshooting with Division 8 as required.

1.09 SYSTEM OPERATION
A. The system shall maintain current operation, coordinate requirements with OPS.

PART 2 - PRODUCTS

2.01 PATHWAYS
A. General Requirements: Comply with TIA/EIA-569-A/B.
B. Types of pathways:
1. Non-Continuous Cable Support:
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
      1) Erico/Caddy
      2) Cooper/B-line
      3) Panduit Corp.
   b. NRTL labeled for support of UTP cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   c. Lacing bars, spools, and D-rings should only be used in the EFs, TRs and ERs.
   d. J-hooks and or adjustable cable supports (also called slings) shall be used in any ceiling space
2.02 MANUFACTURERS
   A. Access control equipment furnished under this section shall be the standard product utilizing manufacturers listed below.

2.03 CONTROLLERS
   A. Standard Controller: Local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personal identity verification devices, door strikes, magnetic latches, gate and door operators, and exit push-buttons. Additional features as follows:
      1. Capable of controlling 2 doors.
      2. Eight general purpose programmable inputs
      3. Six relays, form C outputs
      4. Reports supervised inputs
      5. UL294 Recognized
      6. RS-485 cable interface
      7. HID Mercury MR52-S3

2.04 CARD READERS
   A. HID Signo Reader
      1. 2.4 GHz (Bluetooth) credential compatibility
      2. 13.56 MHz (NFC) credential compatibility
      3. 125 kHz credential compatibility
      4. UL294 certified
      5. Mobile - ready
      6. HID 40NKS-00-00000

2.05 REQUEST TO EXIT MOTION SENSORS
   A. PIR motion sensor
      1. Bosch DS160

2.06 DOOR POSITION SWITCHES
   A. Steel Door Type:
      1. 1” diameter
      2. Dual Pole, Dual Throw (DPDT)
      3. GE 1076D series

2.07 POWER SUPPLIES
   A. Power supplies for power to doors shall be furnished by security contractor. Provide Altronix AL600ULACMCB series power supplies as required to accommodate door controller power in each communications room. Coordinate power supply compatibility with door hardware components prior to ordering.

2.08 CABLES
   A. All access control cabling shall be plenum rated. Provide cable size/quantity configurations for each device as required to perform functions specified.

2.09 Licenses
   A. Procure access control integration licenses for all access control devices. Integrate licenses into existing Genetec software platform.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
   B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

3.02 COORDINATION
   A. Coordinate work with other trades. Coordinate equipment mounting locations with available wall space.
B. Contractor shall notify integration contractor when devices are terminated and ready for integration.

3.03 SYSTEM SOFTWARE, PROGRAMMING, AND COMMISSIONING
A. Provide modifications to existing head-end software to accommodate new access control doors.

3.04 CABLELING
A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible. In exposed structure areas, route conduit tight to structure. Conduit shall be routed parallel and perpendicular to structure in a neat manner. Exposed cabling of any type shall not be allowed.
C. Install cables without damaging conductors, shield, or jacket.
D. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.
E. J-hooks or adjustable cable supports (slings) shall be used in any ceiling space where cable tray is not specified. Maximum distance between supports shall be 5’. J-hooks shall be fastened to permanent building elements (i.e., steel, walls, etc.).
F. Where j-hooks are fastened using support wires, the support wires shall be independent from the other building support wires and shall be secured at both ends. Cables and raceways shall not be supported by ceiling grids.
G. Suspend cable not in a raceway or cable tray a minimum of 8 inches above ceilings.
H. Cable shall not be run through structural members or in contact with pipes, ducts, building structure, or other potentially damaging items.

3.05 GROUNDING
A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."
B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."
C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
D. Bond shields and drain conductors to ground at only one point in each circuit.

3.06 INSTALLATION AND PRE-PROGRAMMING
A. Install access control devices including card readers, request-to-exit devices, and other pertinent equipment.
B. Install door controllers, power supplies, and other equipment in designated rooms. Provide enclosures for equipment. Connect 120V power to power supplies as required.
C. Install Network Interface Device. Connect network interface device to door controllers. Connect network data cable to network interface device and prepare for integration by owner’s security integration contractor.

3.07 IDENTIFICATION
A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and with TIA/EIA-606.
B. Using cable and asset management software, develop Cable Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility’s architectural arrangement.
C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.08 FIRESTOPPING

A. Comply with TIA/EIA-569-A; Annex A, "Firestopping."

B. Select appropriate type or types of through penetration firestop devices or systems appropriate for each type of communications penetration and base each selection on criteria specified herein.
   1. Use firestop devices for all wall, floor, and roof penetrations.
   2. Putty or caulk is only to be used on small penetrations.

C. Selected systems shall not be less than the hourly time delay ratings indicated in the Contract Documents for each respective fire-rated floor, wall, or other partition of building construction. Firestop for each type of communications penetration shall conform to requirements of an independent testing laboratory design drawing or manufacturer's approved modification when used in conjunction with details shown on the Drawings.

D. Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction with respect to size and shape of each opening to be constructed and device or system approved for use in each instance.

3.09 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports:

C. Perform the following field tests and inspections and prepare test reports:
   1. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
   2. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

D. Remove and replace malfunctioning devices and circuits and retest as specified above.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Video surveillance system shall be integrated with monitoring and control system specified in Division 28 Section "Integrated Security System" that specifies systems integration.

1.02 SUMMARY
A. This Section includes devices for a video surveillance system as indicated on the drawings including but not limited to:
   1. Video Surveillance Cameras
   2. Camera mounting hardware
   3. Camera Connection Licenses with Genetec Advantage to match remaining length on Owner's Genetec Advantage Agreement
B. Servers, software and workstations to be provided by the District and programmed by Owner's Security Integrator under separate contract. All equipment furnished under this section shall be compatible with district-wide archiver.
C. Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

1.03 DEFINITIONS
A. AGC: Automatic gain control.
B. FPS: Frames per second.
C. MPEG: Moving picture experts group.
D. Motion JPEG: Motion joint photographic experts group standard.
E. NVR: Network Video Recorder
F. ONVIF: Open network video interface forum.
G. UPS: Uninterruptible power supply.

1.04 SUBMITTALS
A. Product Data: For each type of product indicated, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
   1. Wiring Diagrams: Power, signal, and control wiring, and grounding.
C. Qualification Data: For installer/technician, installation supervisor, and field inspector.
D. Field quality-control test reports.
E. Operation and Maintenance Data:
   1. Provide three (3) copies of operations and maintenance manuals. As a minimum, manuals should include:
      a. Complete schematics of each system component
      b. Troubleshooting procedures
      c. Factory-authorized support information
F. As-Built Drawings upon completion of project.
G. Warranty Information

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Contractor shall have at least 5 years’ experience in the field. Each installer/technician, installation supervisor, and field inspector shall be a certified installer of the system manufacturer. The contractor shall provide at least five references for projects of similar scope and specifications.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with NFPA 70.
D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

1.06 WARRANTY
A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Three years from date of Substantial Completion.

1.07 SYSTEM REQUIREMENTS
A. Video signal format shall comply with ONVIF.
B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
C. Video surveillance system shall seamlessly integrate with monitoring and control system specified in Division 28 Section "Integrated Security System"

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Camera equipment furnished under this section shall be the standard product of Axis whose catalog and model numbers are used to indicate the type and quality of design, material type, and required features.
   1. Provide cameras with individual camera connection license to integrate with Owner’s District Wide Archiver. License shall include Genetec Advantage Agreement to match remaining length on Owner’s Genetec Advantage Agreement.

2.02 CAMERAS
A. Type A - 8.0 Megapixel Indoor Dome Color Camera with the following features:
   1. IP network connectivity, IPV4/V6
   2. Resolution: 3840x2160 images up to 30 fps
   3. PoE power, IEEE 802.3af/at
   4. H.264/H.265 Output, zipstream
   5. Wide Dynamic Range (WDR)
   6. Variable focal lens
   7. Integral IR Illuminator
   8. CMOS image sensor
   9. Adjustable bandwidth control
   10. Built in digital motion sensor
   11. Integral SD memory card (32 GB)
   12. Recessed Ceiling/Wall mount bracket
   13. Outdoor Rated
   14. Axis P3268-LV
B. Type C – 4x4K Outdoor 360 Degree Panoramic Color Camera with the following features:
   1. IP network connectivity, IPV4/V6
   2. Resolution: 4x (3840x2160) at 15 FPS
   3. PoE power, IEEE 802.3af/at
   4. H.264/H.265 Output
   5. CMOS image sensor
   6. Adjustable bandwidth control
   7. Integral SD memory card (32 GB)
   8. IP67 Rated housing
   9. Parapet Mounting Kit – T91D62 telescopic mounting kit
      a. Paint mounting kit to match building exterior surface
   10. Axis MP3738-PLE panoramic camera

PART 3 - EXECUTION
3.01 COORDINATION
A. Coordinate work with other trades. Coordinate equipment mounting locations with available wall space.

3.02 VIDEO SURVEILLANCE SYSTEM INSTALLATION
A. Install cameras and infrared illuminators level and plumb.
B. Install cameras at heights indicated on drawings. Coordinate exact locations in field to avoid obstructions of intended view.
C. Aim cameras at direction of Owner’s Security Contractor.
D. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system component enclosures, and mounted in self-protected, inconspicuous positions.
E. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification of Electrical Systems."

3.03 SYSTEM SOFTWARE, PROGRAMMING, AND COMMISSIONING
A. Head-end Software installation and programming will be a by the Districts Integrated Security System Commissioning Agent. Coordinate installation of licensing for connection to District Archiver with Commissioning Agent.

3.04 CLEANING
A. Clean installed items using methods and materials recommended in writing by manufacturer.
B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.05 DEMONSTRATION
A. Demonstration and training shall be provided as part of a separate contract by Owner’s Security Integrator.

END OF SECTION
EARTHWORK
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SECTION 31 2200  
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Removal and storage of topsoil.
B. Rough grading the site for site structures, building pads, and pavement.
C. Topsoil and finish grading.

1.02 RELATED REQUIREMENTS
A. Section 31 2323 - Fill: Filling and compaction.

1.03 SUBMITTALS
A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE
A. Perform Work in accordance with State of Nebraska, Highway Department standards.
1. Maintain one copy on site.

PART 2 PRODUCTS

2.01 MATERIALS
A. Topsoil: As indicated on the drawings.
B. Other Fill Materials: As indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that survey bench mark and intended elevations for the Work are as indicated.
B. Verify the absence of standing or ponding water.

3.02 PREPARATION
A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.
C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
D. Notify utility company to remove and relocate utilities.
E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING
A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
B. Do not remove topsoil when wet.
C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.
E. When excavating through roots, perform work by hand and cut roots with sharp axe.
F. See Section 31 2323 for filling procedures.
G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.
H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of surface water control.

3.04 SOIL REMOVAL AND STOCKPILING

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.
B. Remove debris, roots, branches, stones, in excess of 2 inch in size. Remove soil contaminated with petroleum products.
C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
D. Place topsoil during dry weather.
E. Remove roots, weeds, rocks, and foreign material while spreading.
F. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
G. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.09 CLEANING

A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.
B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS
A. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
B. Section 31 2200 - Grading: Soil removal from surface of site.
C. Section 31 2200 - Grading: Grading.
D. Section 31 2323 - Fill: Fill materials, backfilling, and compacting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION
A. Identify required lines, levels, contours, and datum locations.
B. Locate, identify, and protect utilities that remain and protect from damage.
C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
   Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 EXCAVATING
A. Excavate to accommodate new structures and construction operations.
B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
D. Do not interfere with 45 degree bearing splay of foundations.
E. Cut utility trenches wide enough to allow inspection of installed utilities.
F. Hand trim excavations. Remove loose matter.
G. Correct areas than are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
I. Remove excavated material that is unsuitable for re-use from site.
J. Remove excess excavated material from site.
K. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.05 PROTECTION
A. Divert surface flow from rains or water discharges from the excavation.
B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION
SECTION 31 2323
FILL

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.
B. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete.
B. Section 31 2200 - Grading: Site grading.
C. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

1.03 DEFINITIONS
A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS
A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .
B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012 (Reapproved 2021).
C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)); 2012 (Reapproved 2021).

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Materials Sources: Submit name of imported materials source.
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING
A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS
2.01 FILL MATERIALS
A. All fill and backfill shall consist of approved material free of organic matter and debris. Use low plasticity cohesive soil having a liquid limit less than 45 percent and a plasticity index between 10 and 20 percent.
B. Concrete for Fill: Lean concrete.
C. Granular Fill - Granular material which is pervious, with 3/4 inch maximum size and less than 5 percent passing a #200 sieve.

2.02 ACCESSORIES
A. Geotextile Fabric: Non-biodegradable, nonwoven.
B. Vapor Barrier; As specified in Section 03 3000 - Cast in Place Concrete.

2.03 SOURCE QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
C. If tests indicate materials do not meet specified requirements, change material and retest.
D. Provide materials of each type from same source throughout the Work.
PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that survey bench marks and intended elevations for the Work are as indicated.
B. Identify required lines, levels, contours, and datum locations.
C. See Section 31 2200 for additional requirements.
D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
E. Verify structural ability of unsupported walls to support imposed loads by the fill.
F. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION
A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING
A. Fill to contours and elevations indicated using unfrozen materials.
B. Fill up to subgrade elevations unless otherwise indicated.
C. Employ a placement method that does not disturb or damage other work.
D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete or fill, compacted as specified.
   2. Other areas: Fill, compacted as specified.
J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
   2. At -3: +4 percent of maximum dry density.
   3. At other locations: ____ percent of maximum dry density.
K. Reshape and re-compact fills subjected to vehicular traffic.
L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 TOLERANCES
A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
D. Proof roll compacted fill at surfaces that will be under slabs-on-grade.
3.06 CLEANING
   A. Leave unused materials in a neat, compact stockpile.
   B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
   C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION
SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
C. Test Reports: Indicate regulatory agency approval reports when required.
D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.
E. Manufacturer's Instructions: Indicate caution requirement.
F. Record and document moisture content of soil before application.
G. Maintenance Data: Indicate re-treatment schedule.
H. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 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.

1.05 WARRANTY
A. See Section 01 7800 - 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.
   2. Repair damage and, if required, re-treat.
   3. Inspect annually and report in writing to Owner. Provide inspection service for 5 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.

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 extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
D. Re-treat disturbed treated soil with same toxicant as original treatment.
E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION
A. Do not permit soil grading over treated work.

END OF SECTION
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EXTERIOR IMPROVEMENTS
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SECTION 32 13 13 - CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY:

A. Work under this section consists of the preparation and placement of exterior portland cement concrete for all pedestrian area concrete site improvements including, but not limited to concrete walk pavement, concrete trail pavement, play and sport court concrete pavement, and concrete pavement under playground surfacing, where located and as detailed on the plans.

B. All concrete work for vehicular pavement areas, including but not limited to parking, drive lanes, drop off lanes and service areas shall be in compliance with the City of Omaha Public Works Department Standard Specifications for Public Works Construction, latest addition.

C. All structurally reinforced concrete work for cast in place construction shall be as designed by the project Structural Engineer and as specified in section 03 30 00, Cast in Place Concrete.

1.2 SUBMITTALS:

A. Provide the following submitted information for the District Representative's approval prior to placement:

1. Production facility certifications.

2. Portland Cement Concrete (PCC) mix design.

3. Aggregate material gradation and physical property certifications.

4. Cement material physical property certifications.

5. Admixture material certifications and manufacturer’s recommendations.

6. Reinforcement material physical property certifications.

7. Expansion joint material certifications and manufacturer's installation recommendations.

8. Cold weather pavement construction protection methods.

9. Curing compound material certifications and manufacturer’s application recommendations.

10. Coloring agent material certifications and manufacturer’s application recommendations.

11. Joint sealing compound material certifications and manufacturer's application
recommendations.

12. Colored concrete sealing compound material certifications and manufacturer’s application recommendations.

13. Concrete stain material certifications and manufacturer’s application recommendations.


15. Pre-cast detectable warning panel sample and manufacturer’s installation recommendations.

16. Concrete delivery truck wash-out method and proposed location.

17. Product data on detectable warning plates.

1.3 QUALITY ASSURANCE:

A. Pre-Installation Conference: Before installing concrete paving the Contractor shall meet on the Project Site with District Representatives, the independent testing agency, and other concerned entities to review the requirements for concrete paving.

B. Concrete Testing Service: the District shall employ the services of a qualified independent testing agency to perform all material evaluation tests and design concrete mixes. The District shall pay for all initial tests of concrete materials; however, any failed tests shall be the responsibility of the Contractor to compensate the independent testing agencies for all retesting necessary to achieve compliance.

C. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA’s "Certification of Ready Mixed Concrete Production Facilities" or equivalent standard.

1.06 PROJECT CONDITIONS:

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Environmental Requirements:


3. Avoid placing concrete when stormy or inclement weather is eminent or prevents good workmanship.

4. Apply anti-spalling compound to concrete pavement when placed after August 1st and opened to traffic prior to March 1st of the following year.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS:

A. Cement: ASTM C150 - Type I or Type II.

B. Normal weight aggregate shall conform to ASTM C33 and shall be formed from sources approved by the Nebraska Department of Roads for Class 47-B Concrete. Except as noted otherwise, aggregate shall be proportioned as follows:
   1. Coarse Aggregate shall be limestone: Thirty percent (30%) of total aggregate by weight.
   2. Fine Aggregate shall be sand gravel (Sand-Gravel): Seventy percent (70%) of total aggregate by weight.
   3. Fly ash shall not be used in the concrete mix without first receiving written permission of the District Representative.

C. Water shall conform to AASHTO T26, Quality of Water to be used in Concrete.

D. Admixtures shall be in accordance with ASTM C494, Standard Specification for Chemical Admixtures for Concrete; ASTM C1017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete; or ASTM C260, Standard Specification of Air-Entraining Admixtures for Concrete. Dosages shall be in accordance with the manufacturer’s recommendations.

2.2 EXPANSION JOINT MATERIAL:

A. Expansion joint material shall be one-half inch (1/2”) non-extruding, expansion joint filler material. It shall conform to the requirements of ASTM D 1751, “Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)”

B. Joint Sealer: Joint Sealer shall conform to the requirements of ASTM D5893:
   1. Expansion Joint Sealer: Vulkem 45 or approved equivalent.
   2. Control Joint Sealer: Vulkem 45 or approved equivalent.
   3. Bitumastic liquid (black in color) material shall not be allowed.

2.3 REINFORCEMENT:
A. Fiber-Reinforcement Concrete Fibers: Discontinuous discrete fibers for the fiber-reinforced concrete shall be made from either glass or polypropylene plastic. Percent of fibers in the concrete shall be between 2% and 4%.

B. Smooth Steel Dowels: Smooth steel dowels, where noted on plans, shall be plain billet bars and conform to ASTM A615. Before delivery to the project, approximately three-fifths the length of each dowel bar may be coated with a suitable paint such as red lead or zinc chromate-iron oxide primer.

   1. Welded Wire Fabric shall be provided in flat sheet. Rolled welded wire fabric will not be accepted for use on the project.

D. Steel Reinforcement: Steel bars for concrete reinforcement not to be bent or straightened during construction shall conform to ASTM A615, Grade 60, deformed. For construction requiring bent bars, use Grade 40 bars in accordance with ASTM A615

E. Supports for Reinforcement: Chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
   1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CURING COMPOUNDS, ADMIXTURES AND ANTISPALLING COMPOUND:

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per square yard and complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171. Where required by local or state environmental regulation, provide materials with a maximum volatile organic compound (VOC) rating of 350 g/L per liter.
   a. Polyethylene film.
   b. White burlap-polyethylene sheet.

C. Clear Waterborne Membrane-Forming Curing Compound: Comply with ASTM C 309, Type 1, Class B.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
      a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
      b. Aqua Resin Cure; Burke Group, LLC (The).
      c. Safe-Cure Clear; ChemMasters.
      d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
f. Nitocure S; Fosroc.
g. Aqua Kure-Clear; Lambert Corporation.
h. L&M Cure R; L&M Construction Chemicals, Inc.
i. 1100 Clear; W.R. Meadows, Inc.
j. Resin Cure E; Nox-crete Products Group, Kinsman Corporation
k. Rich Cure E; Richmond Screw Anchor Co.
l. Resi-Chem Clear Cure; Symons Corporation
m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
n. Hydro Cure; Unitex.
o. Cert-Vex Enviocure; Vexcon Chemicals, Inc.

D. Evaporation Retarder: Waterborne monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:
   a. Cimfilm; Axim Concrete Technologies.
b. Finishing Aid Concentrate; Burke Group, LLC (The).
c. Spray-Film; ChemMasters.
d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
e. Sure Film; Dayton Superior Corporation.
f. Eucobar; Euclid Chemical Co.
g. Vapor Aid; Kaufman Products, Inc.
h. Lambco Skin; Lambert Corporation.
i. E-Con; L&M Construction Chemicals, Inc.
j. Confilm; Master Builders, Inc.
k. Waterhold; Metalcrete Industries.
l. Rich Film; Richmond Screw Anchor Co.
m. SikaFilm; Sika Corporation.
n. Finishing Aid; Symons Corporation.
o. Cert-Vex EnvioAssist; Vexcon Chemicals, Inc.

E. Antispalling Compound: Combination of 50 percent boiled linseed oil conforming to ASTM D 260, Type II, and 50 percent petroleum spirits conforming to ASTM D 235 mixed to conform to AASHTO M233.

2.5 CONCRETE MIX:

A. Mix and deliver concrete in accordance with ASTM C 94, Alternative No. 3.

1. When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 90 minutes (1-1/2 hours) to 75 minutes.

2. When air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes (1 hour).

B. Select proportions for normal weight concrete in accordance with ACI 301, Method 3.
C. Provide concrete to the following criteria:
   1. Compressive strength at 7 days: 3,000 psi.
   2. Compressive strength at 28 days: 4,500 psi.
   3. Slump: Not less than 1 inch and not more than 4 inches.
   4. Mix: 611 pounds of cement per cubic yard minimum, and a maximum water to cement ratio of 0.42.

D. Use of accelerating admixtures in cold weather only when approved in writing by the District Representative. Use of admixtures will not relax cold weather placement requirements.

E. Use of Calcium chloride will not be allowed.

F. Use set retarding admixtures during hot weather only when approved in writing by the District Representative.

G. Add air entraining agent to all concrete. Provide between seven and nine percent (7% to 9%).

2.6 FORM MATERIAL:

A. Wood or steel form material, profiled to suit conditions.

B. Forms: All forms shall be of the same height as the specified thickness of the concrete as shown on the drawings.
   1. Forms that are less than the thickness of the concrete as detailed are unacceptable.
   2. Forms for all curbed walks and for curbing having less than 100-foot radius shall be wood or curved metal. Wood shall be of sufficient thickness to permit bending to the required radius and yet provide rigidity required to resist deformation during concrete placement.
   3. Form Materials: Metal, 10-foot minimum in length and depth equal to thickness of concrete. At integral curbs, additional height required for curb height may be obtained by bolting extra forms to top of main form. Where indicated on the Drawings, face of form shall have a keyway. Form shall be of such dimension and strength required to resist deformation caused by concrete placement or weight of equipment riding atop form. Forms shall have at least three-stake pocket per section. Each section shall have devices to maintain alignment between sections.

C. Form Release Agent: Provide commercial formulation form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
2.7 CRUSHED AGGREGATE BASE COURSE:

A. Crushed aggregate base course shall conform to Section 301, “Aggregate Sub-base/Base Course” and comply with the following Gradation Limits.

1. Gradation Limits:

<table>
<thead>
<tr>
<th>Square Mesh Sieve</th>
<th>Percent Passing (by Weight)</th>
</tr>
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<tbody>
<tr>
<td>1 1/2 inch</td>
<td>100%</td>
</tr>
<tr>
<td>¾ inch</td>
<td>80% +/- 15%</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>53% +/- 17%</td>
</tr>
<tr>
<td>No. 10</td>
<td>20% +/- 10%</td>
</tr>
<tr>
<td>No. 200</td>
<td>5% +/- 5%</td>
</tr>
</tbody>
</table>

2.8 DETECTABLE WARNING PLATES:

A. Detectable Warning Plates shall be as specified by City of Omaha Standard Specifications for Public Works Construction, latest addition and City of Omaha Public Works Department’s Standard Plates. Detectable warning plates shall be colored a “Brick Red” unless otherwise noted on the plans.

B. Detectable Warning Plates shall be a product manufactured and/or distributed by one of the three, approved companies listed below.

1. Cast iron Detectable Warning Plates, model number R-4984 as manufactured by Deeter Foundry, Inc., a Neenah Foundry Company, 5945 North 70th Street, P.O. Box 29708, Lincoln, Nebraska 68529; voice: 402-464-7466 or 800-234-7466; fax: 402-464-8533; web site: http://www.deeter.com; e-mail: sales@deeter.com.


3. “CASTinTACT” as manufactured by MASCO and distributed by Stetson Building Products, Inc., 6820 “J” Street, Omaha, Nebraska 68117; voice: 800-383-1272 or 402-331-0333; fax: 402-331-5999; website: www.stetsons.com; e-mail: tom.broz@stetsons.com.

4. Or Approved Equivalent.

PART 3 - EXECUTION

3.1 GENERAL:

A. The installation shall conform to the requirements of Section 500, “Rigid Pavement” of the Omaha Public Works Department Standard Specifications for Public Works Construction, latest addition or as stated herein, whichever is more stringent.
B. Verify site conditions are ready for the installation of concrete.

C. Verify requirements for concrete cover over reinforcement.

D. Verify that the items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in the placing of concrete.

E. Concrete shall be placed only on a moist base. Concrete shall not be placed on a soft, muddy or frozen base.

3.2 PREPARATION:

A. Prepare the subgrades for concrete as detailed on the plans, parallel to finish grade after compaction. Placement of Base Course shall not take place until compaction tests (minimum of two) have been taken and the required compaction has been achieved.

  1. Proof-roll prepared subgrade surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

  2. Remove loose material from compacted subgrade surface immediately before placing concrete.

  3. The District Representative shall review the sub grade preparation for elevation and compaction prior to placement of concrete and/or aggregate base course.

B. Subgrades shall be parallel to finished grade, to depth specified on the plans.

C. Aggregate Base Course: If required, on prepared subgrade compacted to maximum density, place aggregate base course to depths shown on the plans and as detailed. Compact to ninety-five percent (95%) maximum density.

D. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 LAYOUT:

A. Layout of the pavement shall be as per the plans. Layout shall be done by someone experienced in the layout of such items.

B. Concrete pavement shall be of the width, depth and extent shown on the plans.

3.4 REINFORCEMENT:

A. General: Comply with Concrete Reinforcing Steel Institute’s recommended practice for “Placing Reinforcing Bars” for placing and supporting reinforcement.

B. Place, support and secure reinforcement against displacement by concrete placement. Do not deviate from required position.
1. Place tie bars in the edge of slabs and center in slab. Insert bars through holes in forms. Do not insert bars in unsupported edges of freshly placed concrete.

C. Accommodate placement of formed openings.

D. All reinforcement at the time of concrete placement shall be free of loose, flaky rust and other coatings or films that could interfere with bonding to the concrete.

1. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

E. All reinforcement shall be placed and inspected by the owner prior to placement of concrete.

3.5 FORMS AND SCREEDS:

A. Forms and screeds shall be accurately set to the lines and grades indicated on drawings and be securely staked to prevent settlement or movement during placing of concrete.

B. Forms shall remain in place until concrete has taken its final set.

C. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement. Neatly join and secure form sections together. Rest forms on grade completely along length of form.

D. Check completed formwork and screeds for grade and alignment to following tolerances:

1. Top of forms: Not more than 1/8 inch in 10 feet.

2. Vertical Face on Longitudinal Axis: Not more than ¼ inch in 10 feet.

E. Clean forms after each use and coat with form release agent as required, to ensure separation from concrete without damage.

3.6 JOINTS:

A. General: Construct control (contraction), construction, and expansion joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.

1. When adjoining existing paving, locate transverse joints to align with existing joints, unless indicated otherwise.

B. Install expansion joints where noted on the plans.

C. Edges of joints shall be tooled with an edging tool having a radius of one-quarter inch (1/4”).
D. After the concrete has cured and the tack strips over the joints removed, the joints shall be sealed with an elastomeric sealing compound to within one eighth inch (1/8") of the surface of the concrete slab.

E. Control (Contraction) Joints: Provide weakened-lane contraction joints, sectioning concrete into area as shown on Drawings. Construct contraction joints for a depth equal to at least ¼ of the concrete thickness, as follows:
   1. Tooled Walk Joints and Edges: Form control (contraction) joints in fresh concrete by grooving and finishing each edge of joint with a (1/4-inch) radiused jointer tool. Precut joints when large aggregates are used in order to reposition aggregates away from joint to allow straight, uniform, smooth jointing. Tool the joints prior to brooming.
   2. Tool edge of pavement slabs to produce a rounded corner of ¼-inch radius. Tool edges prior to finishing.

F. Sawed Joints: Form control (contraction) joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random control (contraction) cracks. Next, re-saw the joint to create a reservoir for sealant that is ¼ inch wide by 1 inch deep. Discontinue sawing if a crack develops ahead of saw or immediately adjacent to joint alignment. Rout cracks which develop to a depth of 1 inch and 3/8 inch wide. Hand tool joint where walls or other obstructions prevent saw cutting to slab edge.

G. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than ½ hour, unless paving terminates at isolation joints.
   1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.
   2. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
   3. Provide tie bars at sides of paving strips where indicated.

H. Expansion Joints: From expansion joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated on the drawings.
   1. Locate expansion joints at locations shown on the drawings. Locate in curb and gutters at point of radius curvature and where expansion joint occurs in abutting concrete slab.
   2. Provide 1/2 inch expansion joints with pre-molded asphaltic expansion joint filler, cut to the shape of the cross-section, at seventy-five foot (75’) maximum intervals, where shown on the plans and where new concrete meets existing
Concrete. Trim preformed expansion joint filler with sharp chisel 1/4 inch below top of concrete curbing.

3. Place expansion joint fillers vertically and in true alignment. Place bottom of filler completely through concrete into subgrade at a minimum of ½ inch to totally isolate slabs. Provide a removable metal, plastic, or wood cap strip atop filler to create a 1-inch deep sealant reservoir after cap removal.

4. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

5. Provide one half inch (1/2") diameter, two foot (2'-0") long smooth, steel dowels, at all expansion joints as noted on the plans. Wrap in tar paper or provide metal cap for "Free End" of dowel to prevent adhesion to concrete. Provide 1/2 inch asphaltic type preformed expansion joint filler as described in item 2.02 above.

I. Clean sealant reservoirs at expansion and pavement contraction joints by re-sawing and blowing clean. Install sealant as specified in the project’s specifications.

3.7 PLACING AND FINISHING CONCRETE SLAB:

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
   1. Avoid placing concrete when stormy or inclement weather is eminent or prevents good workmanship.

B. Notify the District Representative at least twenty-four (24) hours prior to commencement of the placement of concrete.

C. Remove snow, ice, or frost from sub-base surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.

D. Moisten subgrade to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

E. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

F. Addition of water to the concrete mixture on site is strictly prohibited.

G. Ensure reinforcement and formed expansion joints are not disturbed during concrete placement.

H. On prepared base course or sub-base course compacted to maximum density, place concrete to depths shown on the drawings and as detailed.
I. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place. Consolidate and smooth concrete to produce a dense pavement free from honeycomb, pockets, or segregated aggregates.

1. Halt concreting operations at expansion or contraction joints whenever concrete placing must be delayed for more than ½ hour. Place a construction joint in place of contraction joint.

J. Do not interrupt successive placement. Do not permit cold joints to occur.

K. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use the equipment and procedures to consolidate concrete complying with ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing and joint devices.

L. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

M. Curbs and Gutters: Spade and tamp concrete curb to produce a dense concrete with mortar worked into surface. Strike off concrete to desired cross section and smooth exposed surface with a wood float. Edge exposed corners to produce a sandy gritty texture.

1. When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

N. Slip-Form Pavers: When automatic machine placement is used for paving, submit revised mix design and laboratory test results that meet or exceed requirements. Produce paving to required thickness, lines, grades, finish, and jointing as required for formed paving.

1. Compact and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

2. Design slipforming equipment to spread, consolidate, screed, place keyway, and float finish concrete in one complete pass. Control alignment of paver utilizing lasers or securely placed guide wires and automatic sensing devices.
O. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

P. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protest concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

   1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement

   2. Do not use frozen materials or materials containing ice or snow.

   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

Q. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.

   1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.

   2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

   3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

R. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.8 CONCRETE FINISHING:

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. When concrete is sufficiently set to withstand foot pressure with only a one-quarter inch (1/4") indentation and the water sheen has left the surface, the slab shall be uniformly finished by floating and troweling.

C. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots while concrete is plastic. Refloat surface immediately to a uniform granular texture.
1. Burlap Finish For Concrete Pavements: Drag a seamless strip of damp burlap across concrete pavement, perpendicular to line of traffic, to provide a uniform gritty texture finish. Rinse or wash drags every four hours. Discard drags that cannot be cleaned.

2. Medium-to-Fine Textured Broom Finish For Sidewalks Less Than Five Percent (5%) Slope: Draw a soft nylon broom across concrete walk surface perpendicular to line of traffic to provide a uniform fine line texture finish.

3. Medium-to-Coarse-Textured Broom Finish For Sidewalks and Ramps Steeper Than Five Percent (5%) Slope: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.9 PAVEMENT TOLERANCES:

A. The concrete surface shall be finished so that the tolerance is one-eighth inch (1/8") measured as the departure from the testing edge of a ten foot (10’) straightedge held parallel to and in contact with the surface.

B. Comply with tolerances of ACI 117 and as follows:

1. Thickness: Plus 3/8 inch (9mm), minus 0 inch (6mm).
2. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed ¼ inch (6 mm).
3. Lateral Alignment and Spacing of Tie Bars: 1 inch (25 mm).
4. Vertical Alignment of Tie Bars: ¼ inch (6mm).
5. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: ½ inch (13 mm).
6. Joint Spacing: 3 inches (75 mm).
7. Contraction Joint Depth: Plus ¼ inch (6 mm), no minus.
8. Joint width: Plus 1/8 inch (3 mm), no minus.

3.10 CURING OF THE CONCRETE:

A. Immediately after placement, cover and protect concrete from premature drying, excessively hot or cold temperatures, rain, rapid temperature change, flowing water and mechanical injury for a period of at least 72 hours immediately after finishing.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Curing method shall be approved by the District Representative.

D. The use of a covering material which contains sugar, or becomes contaminated with sugar in any form, tannic acid, or any other substance considered detrimental to portland cement is not permitted. The initial curing medium shall be effective and applied to prevent checking, cracking, and the appearance of dry spots on surface of concrete. Immediately protect sides of concrete slabs, exposed by the removal of forms, to provide continuance of curing and to prevent injury of slab edges and underlying subgrade. If the temperature is expected to fall below 35°F, cover concrete with straw, hay, or other material maintained on the site and approved by the District Representative, protecting surfaces and edges from freezing until concrete is at least ten days old.

E. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

F. Curing Methods: Cure concrete as follows:

1. Mat Curing: When applying mats or burlap, cotton, or other fibrous material having similar water absorptive properties, thoroughly wet material and keep continuously wet and in intimate contact with covered surface for duration of curing period. Mats shall be uniform in thickness, shall weigh not less than 20 ounces per square yard when dry, and shall be capable of absorbing at least one and one-half times their weight of water. If used, burlap shall be in multiple layers, not single. Mats shall be approved by the OPS Representative.

2. Membrane Curing Compound: No compound shall be used until it has been approved by the OPS Representative. Thoroughly agitate curing compounds during use and spray uniformly on concrete surfaces, in a single coat, with approved spraying equipment, at a rate recommended by the manufacturer, and based on moisture retention tests. Apply immediately following the final finishing operation. Keep concrete surface, to which membrane compounds have been applied, free from foot and vehicular traffic and all other sources of abrasion for a minimum of 72 hours.

G. Anti-spalling Treatment: Apply treatment only when concrete pavement is placed after August 1st and when the pavement will be subject to contamination by deicing chemicals. Apply boiled linseed oil mixture no sooner than 28 days after placement to clean dry concrete pavements free of oil, dirt, or other foreign material. Apply when temperature of concrete and air are at least 40°F and rising. Apply in 2 sprayed applications at rate of 40 sq. yd. per gallon for the first application and 60 sq. yd. per gallon for the second application. Allow complete drying between applications. Avoid spraying bituminous surfaces and sidewalks. Avoid overheating compound due to low flash point.

1. Close treated areas to traffic until slipperiness caused by compound application is lessened.

3.11 PROTECTION OF CONCRETE:
A. Contractor shall protect the finished concrete work against damage while it is curing and from other work of the project.

B. Protect concrete from damage. Exclude traffic from paving for at least fourteen (14) calendar days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion Inspections

3.12 FIELD QUALITY CONTROL TESTING:

A. Testing of concrete shall be done by a qualified testing laboratory employed and paid for by the District. Only tests that pass will be paid for by the District. All required re-testing due to failed results shall be the responsibility of the Contractor and will be deducted from payment in the form of a Contract Change Order.

B. Field Quality control tests to be performed by the testing lab employed by the Owner shall include but may not be limited to compression slump and air entrainment tests.

C. Every seventy-five cubic yards (75 CY) of concrete or fraction thereof delivered to the site shall be tested. All tests shall be taken at the truck prior to the concrete being placed.

1. Three concrete cylinders shall be taken for every seventy-five cubic yards (75 CY) of concrete or fraction thereof.

2. One slump test will be taken for each set of test cylinders taken.

D. Perform smoothness test(s) while concrete is still plastic. Tolerance shall be within 1/8 inch when measured with a 10-foot straightedge placed anywhere on the slab in any direction.

E. Perform thickness testing in accord with ASTM C 174. If directed by the Owner, take one core per 500 square yards at random, evenly divided areas. Cores found to be longer than required thickness shall be considered as required thickness. Remove and replace areas found to less than required thickness less tolerance. Take additional cores for determining limits of deficient thickness. The entire pavement will be considered defective and subject to removal and replacement if the average thickness of all cores exceeds three percent deficient in thickness.

3.13 PATCHING:

A. Allow the OPS Representative to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify the OPS Representative immediately upon discovery.
C. Patch imperfections in accordance with ACI 301.

3.14 DEFECTIVE CONCRETE:

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the OPS Representative.

C. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express direction of the OPS Representative for each individual area.

D. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.

E. Drill Test cores where directed by Owner when necessary to determine magnitude of cracks or defective areas. Fill test core holes in satisfactory pavement areas with portland cement concrete.

END OF SECTION
SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.

1.2 SUMMARY

A. This Section includes materials applicable for commercial/industrial and security chain link fence and gates:

2. Galvanized-steel framework.
3. Polymer coated steel chain link fabric
4. Polymer coated galvanized steel framework and fittings
5. Gates: swing and cantilever slide
6. Installation

1.3 SUBMITTALS

A. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence and gates, details of attachments and footings.

1.4 WARRANTY

A. Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within warranty period specified in the general conditions.

B. Failures include, but are not limited to, the following:

1. Failure to comply with performance requirements.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Faulty operation of gate.

C. Warranty Period: As indicated in General conditions beginning on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC
A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle on both selvages according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings

2. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:
   a. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter - 9 gauge (6 gauge at baseball and softball backstops).
   b. Zinc-coated Fabric: ASTM A 392, Type 2, Class 2, (galvanized) with zinc coating applied after weaving.
   c. Polymer-Coated Fabric: ASTM F 668, Class 2b over zinc-coated steel wire.
   d. Color: As selected by Architect from manufacturer's full range, according to ASTM F 934.

2.2 FRAMING

A. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90.

B. END, CORNER AND PULL POSTS shall be galvanized steel posts of the following type and minimum size:
   1. 2.375-inch O.D. SS-40 pipe weighing not less than 3.12 pounds per lineal foot for fencing up to and including 6'-0" in height.
   2. 2.875-inch O.D. SS-40 pipe weighing not less than 4.64 pounds per lineal foot for fencing greater than 6'-0" and up to and including 9'-0" in height.
   3. 4.000-inch O.D. SS-40 pipe weighing not less than 6.56 pounds per lineal foot for fencing greater than 9'-0" in height.

C. LINE POSTS shall be spaced at 10-feet O.C. maximum, unless otherwise indicated, and shall be galvanized steel posts of the following type and minimum size:
   1. 1.90-inch O.D. SS-40 pipe weighing not less than 2.28 pounds per lineal foot for fencing up to and including 6'-0" in height.
   2. 2.375-inch O.D. SS-40 pipe weighing not less than 3.12 pounds per lineal foot for fencing greater than 6'-0" and up to and including 9'-0" in height.
   3. 2.875-inch O.D. SS-40 pipe weighing not less than 4.64 pounds per lineal foot for fencing greater than 9'-0" in height.

D. Top Rail: Manufacturer's longest lengths with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post. Rails shall be SS-40 pipe, 1.66 O.D. weighing not less than 1.84 pounds per lineal foot.
E. **Bottom Rail**: Manufacturer's longest lengths with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching bottom rail securely to each gate corner, pull, and end post. Rails shall be SS-40 pipe, 1.66 O.D. weighing not less than 1.84 pounds per lineal foot.

F. **Swing Gate Posts**: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900. Post size and weight shall be 2.875-inch O.D. SS-40 pipe weighing not less than 4.64 pounds per lineal foot, unless heavier members are recommended by the gate manufacturer for the size and type of gate specified.

G. **Polymer Coated Framework**: Polymer coated framework shall have a coating fused and adhered to the exterior zinc coating of the post or rail. PVC and polyolefin coatings shall have minimum thickness 10-mils (0.254 mm), polyester coating minimum thickness 3 mils (0.0076 mm) per ASTM F1043. Color to match fabric [dark green] [olive green] [brown] [black] per ASTM F934.

2.3 **SWING GATES**: **COMPLY WITH ASTM F 900**.

A. **Gate Hardware**: Provide galvanized hardware and accessories for each gate according to the following:
   1. **Hinges**: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1½ pair of hinges for each leaf over 6-foot nominal height.
   2. **Latch**: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as an integral part of latch.
   3. **Keeper**: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.
   4. **Gate Stops**: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

2.4 **FITTINGS**

A. **Post Tops**: Provide galvanized steel, and shall fit types of posts furnished, and shall have a hole suitable for through passage of top rail.

B. **Bottom Tension Wires**: Provide 7-gauge, spring wire to match fabric finish.

C. **Post Brace Assembly**: Provide the manufacturer’s standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375-inch diameter rod and adjustable tightener.

D. **Stretcher Bars**: Provide one piece lengths equal to full height of fabric, with minimum cross-section of 3/16-inch by 3/4-inch. Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into post. Stretcher bar bands shall be spaced at not over 15-inches o.c. to secure stretcher bars.
E. Polymer Coated Color Fittings: In compliance with ASTM F626. Polymer coating minimum thickness 0.006 in. (0.152 mm) fused and adhered to zinc coated fittings. Match color to fence system.

F. Wire Ties: For tying fabric to line posts, provide galvanized steel wire ties spaced 12-inches o.c. For tying fabric to rails and braces, use wire ties spaced 24-inches o.c. For tying fabric to tension wire, use wire ties spaced 24-inches o.c.

3.1 EXECUTION

A. Installation
   1. Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed.

B. Excavation: Drill holes for posts in firm, undisturbed or compacted soil of sizes as follows:
   1. Corner, end, and pull posts - 12-inch diameter by 3'-6" deep
   2. Line posts - 10-inch diameter by 3'-6" deep
   3. Gate posts - 6-inch diameter by 4'-0" deep

C. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

D. Setting Posts: Center and align posts in holes 4 to 6-inches above bottom of excavation. All posts shall be embedded at least 36-inches in the concrete footings except gate posts shall be embedded at least 42-inches. Top of footings shall be 2 inches above grade and sloped to direct water away from posts, except where surrounded by paving. Place concrete around posts and vibrate or tamp for consolidation. Position and hold each post for vertical and top alignment, during placement and finishing operations as required.

E. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install tension wires before stretching fabric and tie to each post with not less than 6 gauge galvanized wire. Fasten fabric to tension wire using 11 gauge galvanized steel hog rings spaced 24-inches o.c.

G. Fabric Installation: Leave approximately 2-inches between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

H. Stretcher Bars: Thread through or clamp to fabric 4 inches o.c. and secure to posts with metal bands spaced 15-inches o.c.
I. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend wire to minimize hazard to persons or clothing.

J. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

K. Gates: Install swing gates and cantilevered slide gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary. Test all gates for proper operation.

L. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.

M. CLEAN UP Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION
SECTION 32 33 00 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 0I – General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUBMITTALS:

A. Provide the name of the furnishing pieces and manufacturers intended to be use on the project. If more than one piece of furnishing is listed as an approved item in the project’s contract documents.

B. Provide a copy of the manufacturer’s installation manual for all furnishings prior to beginning the installation of any piece.

C. Provide an insurance certificate that adheres to the Omaha Public School requirements for vendor insurance coverage, naming OPS as additional insured on the GL and Umbrella on a primary non-contributory basis, including completed operations:

   1. Commercial General Liability in the amount of $1 million per occurrence/$2 million aggregate.

   2. Automobile liability in the amount of $1 million per occurrence/$1 million aggregate to include all owned vehicles, hired vehicles and non-owned vehicles used by the vendor on OPS premises.

   3. Umbrella Liability in the amount of $1 million per occurrence/$1 million aggregate.

   4. Worker’s compensation coverage to the statutory limits and Employers Liability.

   5. General Liability and workers compensation insurance will include a waiver of subrogation in favor of Omaha Public Schools.

   6. The remarks section should read: Additional Insured (GL & Umbrella): Omaha Public Schools. General Liability to be on a primary and non-contributory basis, including completed operations. Waiver of Subrogation (General Liability and Work Compensation) in favor of Omaha Public Schools.

D. Provide warranty certification or letter on the furnishings with details of warranty coverage and limitations.
Site Furnishing

1. The letter must be on the company letterhead or a form that shows the name of the company, address, phone number and contact name for the company representative.

2. The letter must be signed by a company owner or officer.

PART 2 - PRODUCTS

2.1 TRASH RECEPTACLES:

A. Surface mount trash receptacles shall comply with the following requirements:

1. Receptacles shall be 32-gallon, round receptacle of one-piece welded construction, fabricated from 12 ga. min. perforated steel welded to 1/8 inch x 2 inch formed steel edge bands and reinforced by 1/8 inch steel bars and 1/4 x 1/8 inch angle.

B. Coating shall be one of the following:

1. Plastisol ultraviolet stabilized vinyl coating, eighth inch to one quarter inch (1/8” to 1/4”) thick, fused and baked to ninety percent (90%) gloss.

2. Polyethylene copolymer-based thermoplastic, oven-fused.

C. Liners shall be 32-gallon, provided by same manufacturer as receptacle.

D. Surface mount post package shall be provided.

E. Lids shall be flat top with minimum 8” diameter opening, fabricated of 18-gauge galvanized steel with powdercoated finish.

F. Lids shall be furnished with a heavy-duty stainless steel aircraft cable for attaching to the receptacles.

G. Colors to be selected by the Owner Representative from the manufacturer’s standard colors after award of the contract.

H. Acceptable Manufacturers:

1. Anova, Model: D1021M

2. Leisure Craft, Model: R32-PERF

3. Wabash, Model: LR305P w/ FT100

4. Or Approved Equivalent.

2.2 MATERIALS
A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
3. Structural Pipe and Tube: ASTM B 429/B 429M.
5. Castings: ASTM B 26/B 26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Perforated Metal: From steel sheet not less than 12 gauge; manufacturer's standard perforation pattern.
7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.

C. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

D. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.

E. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.

1. Polyethylene: Fabricated from virgin plastic HDPE resin.

F. Anchors, Fasteners, Fittings, and Hardware: Stainless steel, Brass, Galvanized steel, Zinc-plated steel, Manufacturer's standard, corrosion-resistant-coated, or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on-grade substrate; extent as indicated on Drawings or as indicated by Manufacturer.
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; extent as indicated on Drawings or as indicated by Manufacturer.

G. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 ALUMINUM FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
2.4 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.5 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.6 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1. Run directional finishes with long dimension of each piece.
   2. Directional Satin Finish: No 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION
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SECTION 32 91 00 - TURF SODDING AND SEEDING

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes provisions for the following items: turf grass sodding, turfgrass seeding, fertilizer, crimped straw mulch, maintenance period and instructions.

1.2 SUBMITTALS
A. Submit, in accordance with General Conditions, qualifications and product data showing materials and details of installation for:

1. Certification of each seed mixture, stating the botanical and common name, origin of seed source, including name and telephone number of supplier. Seed must be Certified Blue Tag standard with 0% Other Crop Seed and 0% Weed Seed.

2. Complete description of fertilizers.

3. Complete description of herbicides and pesticides.

4. Complete description of temporary erosion control matting or hydromulch as called for within the Contract Documents – product and rates of application.

5. Contractor provided field supervisor qualifications.

1.3 QUALITY ASSURANCE
A. Engage a single company specializing in turf seed installation and establishment with a minimum of 5 years experience who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishments.

B. The Contractor shall provide a field supervisor who shall meet one of the required qualifications:

1. A minimum of an Associates of Applied Science Degree in Horticulture, Botany, Soil Physics, Agronomy, General Agriculture, Agricultural or Biological Engineering, or a related field.

2. A minimum 5 years’ experience of work similar in material, design, and extent to that indicated for this project.

3. The above-described individual(s) shall be on the project during the following work: turf grass seeding and turf sodding activities.
1.4 DELIVERY, STORAGE, HANDLING
A. Seed and other Packaged Materials: Deliver packaged seed materials in original sealed, labeled, and undamaged containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

1.5 PROJECT CONDITIONS
A. Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

a) When conditions detrimental to native plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner’s Representative before planting.

b) Planting Conditions: Install seed under planting conditions conducive to turf grass seed germination and when existing and forecast weather conditions are suitable for work. Do not sow on windy days, when ground is frozen, wet, or otherwise prohibitive to drill seeder equipment’s proper function.

D. Refer to Plan Notes for further instruction on project conditions prior to planting.

PART 2 - PRODUCTS

2.1 SEED

A Turf grass Restoration (seed blend)

1. Provide fresh, clean, dry, new-crop seed complying with AOSA’s ‘Journal of Seed Technology; Rules for Testing Seeds’ for purity and germination tolerances.

2. Contractor shall provide either a proprietary prepared mixture or a customized mixture to comply with the project that is turf type dwarf Tall Fescue dominant.

a. Seed mix shall be one of the following:
1. ‘Super Turf I’ as provided by United Seeds, Inc., Ralston, NE (www.unitedseedsonline.com). Latest species, cultivars, and percentage of mix.

3. Or as approved by Owner’s Representative in writing.

2.2 TURFGRASS SOD

a. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

b. Turfgrass Species: Sod of grass species shall be a turf type fescue blend suitable for use in the Omaha environmental conditions – ‘Super Turf I’ as provided by United Seeds or as approved by Owner’s Representative in writing.

2.3 FERTILIZER

a) Contractor shall provide a complete commercial fertilizer, 10-10-10 grade for grass areas or as approved by Owner’s Representative in writing. It shall be delivered to the site in the original unopened containers each showing the manufacturer’s guarantied analysis. Store fertilizer so that when used it shall be dry and free flowing.

2.4 PESTICIDES AND HERBICIDES

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

2.5 WATER

A. The Contractor shall be allowed used of Owner's water on site for use in irrigating the project. The Contractor shall pay for all costs of metering and permissible use of hydrants as administered by Metropolitan Utilities District (MUD) if existing fire hydrants are utilized for water. The Contractor shall provide all needed hose, sprinkler heads and other appurtenances. The water shall not contain material injurious to plant.
PART 3 –EXECUTION

3.1 EXAMINATION

A. Examine areas to receive seed mixes for compliance with requirements and for conditions affecting performance of work of this specification. Do not proceed with installation until 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 PLANTING SOIL PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

3.4 SEEDING

A. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other by mechanical drill seeding. No broadcast seeding allowed unless approved by Owner’s Representative in writing due to size of seeding area, slopes or other site conditions not conducive to mechanical drill seeding activities. Do not seed against existing trees. Limit extent of seed to outside edge of tree planting saucers.

1. Sow seed at a total rate as recommended by seed supplier; however, application rate shall be no less than 12 lbs per 1000 SF.

2. Apply mildew and seed-free straw across all seeded areas at a rate of 4 lbs per 1000 square feet and crimp to adhere to soil outside of drainage flow paths and on slopes up to 1:6.

3. Apply hydromulch applied at product manufacturer’s recommendations or a 12 month biodegradable turf reinforcement matting (TRM) on all slopes greater than 1:6 and within drainage flow paths.

3.5 SEEDING SATISFACTORY COVERAGE
A. Seeded areas will be satisfactory provided requirements have been met and healthy, well-rooted, even-colored, viable grass is established with a coverage of 90% in a randomly identified 10'x10' area.

B. Replant seed mix that does not meet requirements until satisfactory coverage is achieved.

3.6 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod supplier but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.7 SODDING SATISFACTORY COVERAGE

A. Sodded areas will be satisfactory provided requirements have been met and healthy, well-rooted, even-colored, viable grass is established, free of weeds, open joints, bare areas and surface irregularities.

PART 4- ESTABLISHMENT AND MAINTENANCE

4.1 MAINTENANCE

A. Begin establishment and maintenance immediately after planting for seeded areas. Establishment and maintenance shall continue for no less than 60 days from approved completion of seeding and include 1 mowing.

B. Begin establishment and maintenance immediately after planting for sodding areas. Establishment and maintenance shall continue for no less than 30 days from approved completion of sodding and include 1 mowing.
C. Establish turf grasses by watering, mowing, weeding, trimming, re-seeding, over-seeding, spot weed eradication, and other operations as necessary to achieve contract compliance. Re-grade erosion rills, re-seed bare or eroded areas, and re-mulch as necessary to produce a uniform turf grass stand.

END OF SECTION
SECTION 32 91 15 - SOIL PREPARATION - DEEP CULTIVATION

GENERAL

1.1 Summary

Section includes:
Remove topsoil, condition soil by shattering, spread topsoil, tilling, providing soil amendments, and final pulverizing of the upper layer of soil.

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications

1. If imported topsoil is required to complete the requirements of the project, to qualify for acceptance, an independent testing agency must demonstrate to Owner’s Representative's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work. The testing Agency shall be accredited by the American Association for Laboratory Accreditation and on the USGA preferred labs list.

2. Prior to delivery of topsoil, if required, furnish Owner’s Representative with written statement giving location of properties from which the topsoil is to be obtained, names and address of owners, depth to be stripped, and crops grown during the past 2 years.

3. The textural analysis and organic matter content of the topsoil properties shall be used to evaluate conformance.

1.3 SUBMITTALS

A. If imported topsoil is required to complete the requirements of the project, submit soil test analysis reports for each sample of topsoil from an approved independent soil-testing laboratory to the Owner’s Representative. The following ASTM testing protocols shall be followed for onsite and offsite topsoil products:

1. ASTM D3665-02: Standard Practice for Random Sampling of Construction Materials;


4. Soil Classifications should be defined by the USDA NRCS Urban Soil Primer, 2005.

B. Chemical analysis, performed in accordance with current AOAC Standards, will include the following:
1. pH and Buffer pH;

2. Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees Fahrenheit, plus or minus 9 degrees;

3. Analysis for nutrient levels by parts per million including calcium, magnesium and micronutrient levels. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil as calculated by the amount of material to be added per volume of soil for the type of plants to be grown in the soil;

4. Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in millimho per cm;

5. Cation Exchange Capacity (CEC) shall be less than 10;

D. All testing and analysis shall be at the expense of the Contractor.

1.4 MATERIALS

A. Imported Topsoil (if required):

1. ASTM D5268, fertile, friable, natural silty clay loam, surface soil, reasonably free (less than 5 percent of total volume) of subsoil, clay lumps, brush, weeds, and other litter, and free of roots, stumps, stones larger than 1 inch, in any dimension, and other extraneous or toxic matter harmful to plant growth, approved by Owner’s testing agency. Acidity range (pH): 5.5 to 7.5. Organic matter content: 4 to 25 percent. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at Project site.

2. Obtain topsoil from naturally, well drained sites, where topsoil occurs in a depth of not less than 4 inches. Do not obtain from bogs or marshes. Designate proposed topsoil borrow area and, in addition to required soil test submittal specified under Section 1.5, permit Owner’s testing agency to sample as necessary from borrow area for the purpose of making acceptance test to confirm quality of proposed material. Remove particles larger than 1 inch in size. Process, clean, and prepare imported topsoil to comply with specified criteria.

B. Compost Soil Amendment

1. Compost shall be derived from plant material and meet the general criteria set forth by the U.S. Composting Seal of Testing Assurance (STA) programs follows:

   a. Material must pass through a half-inch screen;
   b. Material pH should be between 5.5 and 8.5;
   c. Material should contain less than 1% inert material by weight;
   d. Material should contain more than 35% organic matter;
   e. Material salt content should be less than 6 mmhos/cm;
f. Material should meet STA standards for maturity and stability;
g. Material carbon to nitrogen ration should be less than 25-to-1;
h. Material must meet EPA standards for heavy metals; and,
i. Material dry bulk density should be between 40 to 50 lbs per cubic foot.

PART 2 EXECUTION

2.1 PREPARATION

A. Prepare areas shown to receive deep cultivation by removing topsoil prior to mass grading operations.

B. Complete grading operations within areas to receive deep cultivation in accordance with the Drawings.

2.2 EQUIPMENT

A. Accomplish deep soil shattering using a subsoiler capable of shattering the soil to a minimum 6-inch depth.

B. The subsoiler shall have a minimum of three high-life wing shanks set at a maximum horizontal spacing of 30 inches.

C. Two of the shanks shall be set in line with the power unit’s wheels/tracks to remove any soil compaction related to the soil shatter operations.

D. Do not use an agricultural disk, chisel plow, or bulldozer with ripper for deep soil shattering.

2.3 DEEP CULTIVATION

A. Perform deep soil shattering with spacing on implement shanks set so that subsoil between shanks is fully shattered at the 6-inch depth.

B. Do not perform soil shattering operations if soils are frozen, wet, or muddy.

C. Upon completion of subsoil operations:

1. Spread topsoil evenly on designated areas to a depth, which after settlement and compaction, shall be three (3) inches, unless otherwise directed by Owner’s Representative.

2. Thoroughly till entire area to a depth of no less than 8 inches to fully break up soil clods and till topsoil into upper 8 inches of soil.

3. Do not undertake operation if organic material or subgrade is frozen.

D. After topsoil placement and tillage:
1. Amend all areas to receive deep cultivation by placing a minimum two-inch depth of organic material to full extent of the area.

2. Thoroughly till entire area to a depth of no less than 8 inches to fully break up soil clods and provide uniform planting bed of pulverized soil ready to receive seed.

3. Do not undertake operation if organic material or subgrade is frozen.

E. If compaction occurs within deep cultivated areas after tilling operations are complete, loosen soils within the compacted areas utilizing a rotary device capable of reaching a depth of 8 inches below the surface.

END OF SECTION
SECTION 32 93 00 – EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

This section includes provisions for root beneficial planting method trees, balled and burlapped trees, shrub plant material, plugged and potted plant material, mulch, establishment and maintenance, and instructions:

1.01 SUBMITTALS

A. Submit qualifications and product data showing materials and details of installation for:

1. Submit list of sources for all plant materials for approval prior to delivery to site. Plant material sources shall include the names and locations of nurseries proposed as sources of acceptable plant materials and a list of the plants each nursery shall provide. The plant list shall include the botanical and common name and the size at the time of selection. Plant material shall be purchased from a growing nursery, and shall be obtained from growing location within same horticultural climate zone or lower than the project site as defined by the USDA. Wholesale and resale plant suppliers shall not be used as sources unless the contractor can certify that the required plant materials are not available from a growing nursery. When utilized, the contractor shall submit the name and location of the growing nursery from where the plant material was obtained.

2. During course of installation, carefully record in red line on a print of the planting drawings all changes made to the planting layout during installations; approved by the District Representative. Final payment for planting will not be authorized until an accurate and complete as-built is submitted.

3. Complete description of anti-desiccant for use on plant material.

4. Complete description of double-ground hardwood mulch

5. Contractor provided field supervisor qualifications.

1.2 QUALITY ASSURANCE

A. For contracting the installation of plant material, engage a single company specializing in plant installation and establishment with a minimum of 5 years experience who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishments.

B. The Contractor shall provide a field supervisor who shall meet the required qualifications:

1. A minimum of an Associates of Applied Science Degree in Horticulture, Botany, Soil Physics, Agronomy, General Agriculture, Agricultural or Biological Engineering, or a related field.
2. A minimum 5 years experience of work similar in material, design, and extent to that indicated for this project.

C. Source Quality Control

3. All purchased or donated plant materials shall have certificates of inspection required by USDA and State of Nebraska.

4. All purchased packaged materials shall be delivered to the site in their original containers with all labels showing weight, analysis, and name of manufacturer intact and legible. Use all means necessary to protect all materials from deterioration before and during delivery, and while stored on site.

5. Plant providers should not prune just prior to delivery. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape. Provide protective covering during delivery. Plants with damaged or broken containers shall be subject to rejection.

1.3 OBSERVATIONS

A. Contracted landscape contractor should deliver plant material after preparations for planting have been completed and plant immediately. The landscape contractor should be responsible to coordinate with the District Representative when planting preparations are complete. The District retains the right to observe trees and shrubs for size and conditions of balls and root systems, insects, injuries, and latent defects, and to reject unsatisfactory or defective material at any time during progress of work as well as condition of potted and plugged plant material. The landscape contractor shall remove rejected plants immediately from project site and replace at the Contractor's expense with approved materials. It is recommended to further retain the right for:

1. Observation of labels and the condition of all items delivered to the site;

2. Observation of any repairs or replacements that are necessary;

3. Review and approve or adjust plant material locations;

4. Observation of bed preparation and tree pits prior to planting;

5. Observation of plant material at end of plant warranty period.

1.4 PROJECT CONDITIONS

A. Determine location of underground utilities and perform work in a manner that will avoid possible damage. The landscape contractor is responsible to initiate a utility locate through the Nebraska 'One Call – 811' public service. Landscape contractor shall hand excavate tree and shrub pits to better avoid severing any known or undiscovered utilities.
B. When conditions detrimental to plant growth are encountered, such as pebble fill, adverse drainage conditions, or obstructions, The Landscape Contractor shall coordinate with the District Representative to determine revising the location for planting.

1.5 SEQUENCING AND SCHEDULING

A. All planting shall be performed during favorable weather conditions. The planting operations shall not be performed during times of extreme drought, when ground is frozen, or during times of other unfavorable climatic conditions unless otherwise approved by the District. The Contractor assumes full and complete responsibility for all such plantings and operations.

B. Recommended dates for tree and shrub planting shall be March 15 – June 15 and August 15 – November 30.

C. The District shall retain the sole authority to establish seasonal limitations regarding the installation of biological plant materials. The initiation of a delay or the designation of a suitable planting period shall be considered incidental and shall be provided by the landscape contractor at no additional cost to the District.

1.6 PLANT ESTABLISHMENT AND WARRANTY PERIODS

A. The Landscape Contractor be responsible for installed plant material to protect against defects including death and unsatisfactory growth for (the period defined in the contract) (insert duration of maintenance period). Defects resulting from incidents that are determined beyond the Contractor’s control such as theft, vandalism, or damaging storm event will be excluded from responsibility. Weather extremes related to temperature or moisture otherwise shall not be considered beyond the Contractor’s control.

B. The landscape contractor shall provide a warranty of (1 calendar year) (insert duration of warranty wanted for the project) for all plant material provided and installed commencing from the time of completed installation. The landscape contractor shall replace all dead plants and all plants not in a vigorous, thriving condition as determined by the District at the end of the Warranty Period. Contractor shall plant replacements as soon as weather conditions permit, and within a specified planting period. The replacement plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size, and color. Plant material to be replaced shall be installed at no cost to the Owner.

C. Replacements, beyond those available, shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in the Specifications.

D. The Contractor shall make all necessary repairs to any portions of the site which may be damaged due to plant replacements (including tire ruts within turf areas). Such repairs shall be done at no cost to the District.

PART 2 - PRODUCTS
2.1 MATERIALS

A. Plant Materials

1. All Trees or shrubs designated balled and burlapped ("B&B") shall be adequately balled with firm natural balls of earth of a diameter and depth no less than that specified in ANSI 60.1-1986. Balls shall be firmly wrapped with burlap. All plants which are 2" in caliper or over shall be drum laced. No balled trees or shrubs shall be planted if the ball is cracked or broken either before or during the process of planting. Container grown plants will be acceptable in lieu of balled and burlapped deciduous plants subject to specified limitations of ANSI Z60.1 for container stock.

2. All materials shall be inoculated with a suitable mycorrhizal inoculant by the plant provider.

3. Scientific and common names used for plants are generally in conformity with "Standardized Plant Names." The names of varieties are generally in conformity with the names accepted in nursery trade. Plant material size and measurements shall conform to the “American Standard for Nursery Stock”, ANSI Z60.1-1986.

4. Plants shall be nursery grown, freshly dug, vigorous stock, normally shaped, heavy and well branched foliage when in leaf and shall have healthy, well-developed root systems. Trees must be self-supporting with straight trunks and with leaders intact. All plants furnished shall be free of any insect infestation, dead wood, bruises, or other root or branch injuries and shall have been grown under climatic conditions with temperature extremes similar to those of the project area for a minimum of two years prior to use on this project.

5. Plants shall not be pruned before delivery. Trees, which have a damaged or crooked leader or multiple leaders, unless otherwise specified, will be rejected. Trees with abrasion of bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 1 inch in diameter which have not completely calloused will be rejected. Plants shall be measured when branches are in a normal position. If a range of size is given, no plants shall be less than the minimum size and not less than 50% of the plants shall be as large as the upper half of the range specified. The measurements specified are the minimum size acceptable and are the measurements after pruning where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread will be rejected. Plants shall be true to species and variety and shall conform to measurements specified in the Plant Schedule, except that plants larger than specified may be used if approved by the Owner. Use of such plants shall not increase the contract price. If larger plants are approved, the ball of earth shall be increased in proportion to the size of the plant according to ANSI Z60.1-1986. Plants planted in rows shall be matched in size and form.

6. Root balls shall be adequately protected at all times from sun and from drying winds. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and well protected with soil or other acceptable material. Plants shall not remain unplanted for longer than day of delivery.

7. Plug packs and potted plants should be adequately protected from the sun and from drying winds until planted. All plugged and potted plants which cannot be
planted immediately upon delivery should be set on the ground in the shade. Plants should not remain unplanted for longer than one half day after delivery.

8. All plant materials shall bear a tag providing full and legible identification of plant genus, species and variety.

B. Mulch

9. Double-ground hardwood mulch that is free from deleterious materials shall be used for top dressing of trees. Size of particles may vary from minimum of ¼ inch to maximum of 2 inches. Artificially dyed mulch product is not allowed.

C. Tree Protection

10. Utilize Open mesh, low-density polyethylene, 42 inches in length minimum up to first branching, shall be placed on each tree trunk to reduce harm from rabbits, rodents, deer, and light mechanical damage.

D. Tree Stakes and Guys

11. With approval from the District, select trees shall be staked with 3 hardwood posts. Stakes shall be approximately 2" wide and 6-6.5 feet long. Posts are to be driven a minimum of 2 feet into undisturbed stable earth. Any trees staked shall be as detailed on plans. An acceptable tree tie is one that is easily adjustable, strong in all weather, and is easily attached and removed. Hose and wire are not acceptable for staked trees. Provide the following:

12. Tree tie webbing;

a. 1” wide Arbor Tie nylon straps specifically provided for use in tree stabilizing activities.

13. Tree staking shall not remain on a tree beyond one year from time of installation. The Landscape Contractor shall return to remove all tree tie material at no additional cost to the District.

E. Anti-Desiccant

14. Emulsion type, film-forming agent designed to permit transpiration, but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 PLANTING SITE CONDITIONS

A. Prior to all plant installation, carefully inspect the site location to determine this installation may properly commence (delay planting if conditions are saturated from rain or adjacent to any other construction activity taking place or planned shortly after planting).
3.2 PREPARATION FOR PLANTING OF TREES

A. Unless directed by the District Representative, the indication of a plant on the planting plan is to be interpreted as including the digging of a hole, furnishing of a plant of the specified size, the work of planting, wrapping and other activities where called for.

B. Consult the plans for type and size of and types of trees and shrubs. The Contractor shall be responsible for selection and tagging at nurseries stocking the specified materials. Contractor shall inform the District Representative three (3) days in advance when planting will commence, of anticipated delivery date of material, and will furnish an itemized listing of actual quantities of plant materials to be delivered. Failure to notify the District Representative in advance, in order to arrange proper scheduling, may result in loss of time or removal of any plant or plants not installed as specified or directed.

3.3 EXCAVATION FOR TREES

A. Holes for root beneficial planting method trees shall be a minimum of 2 times greater than the plant container size.

A. Holes for balled and burlapped trees shall be a minimum of 2 times greater in diameter than the spread of the root ball and at a depth such that root flare is even with or 1” above grade.

3.4 PLANTING TREES AND SHRUBS

A. Remove plant from container, set container stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top crown of plant at 2 inches above elevation adjacent to finished landscape grades. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. Plants shall be backfilled with soil excavated from the plant pit that is spaced and broken up as it is placed. Soil clods over 2 inches will not be permitted. When excavation is approximately 2/3 full, apply specified fertilizer and water thoroughly before placing remainder of backfill.

B. Repeat watering until no more is absorbed. After watering, backfill with soil mixture until the surface of the backfill is level with the surrounding grade.

C. For balled and burlapped trees: cut and remove all ropes, wire or strings from top of ball after plant has been set. Leave burlap wrapping intact around balls. Turn under and bury portions of burlap exposed at top of ball. Containers for container-grown or supplied plant materials shall be completely removed.

3.5 POTTED PLANTING

A. Set potted stock in planting beds at the spacing identified on a design plant schedule or relative to the mature size of each respective species and set at the same elevation as adjacent finished landscape grades.

3.6 DOUBLE-GROUND HARDWOOD MULCH
A. Apply double-ground hardwood mulch for each planting to a maximum depth of 3" around all trees and shrubs and a maximum of 2" around all plugged and potted plant material. The Contractor shall determine his own quantities based on the area, the work and site investigations. Provide the depth for all trees and shrubs.

3.7 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition. Properly dispose of all resultant dirt, debris, and other waste material.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed by the Owner at no additional cost, unless damage is the result of vandalism.

C. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off District property.

PART 4 - MAINTENANCE

4.1 MAINTENANCE

A. Begin maintenance immediately after planting. Maintenance shall continue for (the period defined in the contract) (insert duration of maintenance period).

B. Maintain Plant materials by watering, cultivating, and weeding as required for healthy growth. Plants shall be inspected by the Contractor’s qualified field supervisor and needed maintenance performed promptly throughout the establishment period and by a District representative prior to completion of the establishment period.

4.2 OBSERVATION AND ACCEPTANCE

A. When landscape work is completed, the District Representative will, upon request, make an observation to determine acceptability. Landscape work may be observed for acceptance in portions as agreeable to the District, provided each portion of work offered for observation is complete.

B. When observed landscape work does not comply with requirements, replace rejected work and continue specified maintenance until approved by District and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION
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